



Forest Practices Application/Notification
Office Checklist Page 1
Northwest Region

FPA/N #: _____

Received Date: _____

Completed Date: _____

WDFW Concurrence Due Date: **N/A**

WDFW Concurrence Received: _____

Comments Due Date: _____

Decision Due Date: _____

FP Forester: _____

WDFW Biologist: _____

Shutdown Zone: _____

FPA/N CLASSIFICATION: ☐ II ☐ III ☐ IVG ☐ IVS		☐ Biomass ☐ 20-Acre Exempt EARR TC ☐ Yes ☐ No	
Landowner Name:		Project Name:	
WRIA: _____		WAU: _____	
WRIA: _____		WAU: _____	
WRIA: _____		WAU: _____	
Legal: _____		County: _____	
Activity Type(s):	Harvest: _____ ac	Crossing: _____ #	Rock Pit: _____ ac
	Spoils: _____ cy	Construction: _____ ft	Abandonment: _____ ft

ALTERNATIVE PRESCRIPTIONS

- ☐ Alternate Plan ☐ Fixed-Width ☐ Overstocked
☐ 10-Year Management Plan ☐ Statement of Intent
☐ WAU Prescriptions: _____
☐ Other: _____

- ☐ Habitat Conservation Plan ☐ HCP Crosswalk(s)
☐ Landowner Option Plan for Northern Spotted Owl
☐ Cooperative Habitat Enhancement Agreement
☐ Other: _____

RESOURCE REVIEW

- ☐ Potentially Unstable Slopes ☐ In ☐ Around
☐ Soils Map ☐ Highly Erodible ☐ Highly Unstable
☐ SLPSTAB | ☐ 40+% ☐ 70+%
☐ Landslide Inventory Polygon
☐ Avalanche ☐ WSDOT ☐ FP
☐ Rain-on-Snow ☐ Outside Approved WA
☐ Hydric Soils
☐ Wetland ☐ Forested ☐ A ☐ B ☐ HCP
☐ In WMZ of ☐ A ☐ B Wetland
☐ In RMZ/ELZ of Type ☐ S ☐ F ☐ Np
☐ HCP Buffers ☐ LGE Buffers ☐ Np 29'

- ☐ FPHCP Bull Trout Populations of Concern
☐ WNHP Rare Species
☐ Group A or B Water Supply
☐ Hatchery | Name: _____
☐ Even-Aged Harvest greater than 120 Acres
☐ Ground-based Equipment on Slopes at or greater than 40%
☐ Road Construction on Slopes at or greater than 60%
☐ Saltwater Islands ☐ Long Term Commitment Area
☐ In or Over Typed Water ☐ S ☐ F ☐ Np ☐ Ns
☐ FPF Verification Needed ☐ Wetland ☐ Water
☐ GRT/WRT ☐ FREP

ASSOCIATED NON-SCANNED DOCUMENTS – On file with the FPA/N at the Region office.

- ☐ SEPA Checklist/Documents ☐ Other: _____

ASSOCIATED SCANNED DOCUMENTS

- ☐ Appendix A: Water Type Classification Worksheet
☐ New ☐ Old | WTMF # _____
☐ Appendix D: Slope Stability Informational Form
☐ Qualified Expert ☐ Report ☐ Letter/Memo
☐ Appendix E: CMZ Assessment Form
☐ Appendix F: Stream Shade Assessment ☐ 16° ☐ 18°
☐ Appendix G: Np RMZ Worksheet
☐ Appendix H: Natural Regeneration Plan

- ☐ Appendix I: Watershed Analysis Worksheet
☐ Appendix J: Marbled Murrelet Form
☐ FPHP Plans & Specifications
☐ SFLO RMAP Checklist ☐ FFFPP
☐ COHP ☐ DFC Printout
☐ SEPA DNS/MDNS ☐ LGE Permit(s)/Info
☐ Other: _____
☐ Other: _____
☐ State Lands Water Typing Key

ADDITIONAL COMMENTS

☐ ENF # _____ ☐ Previous FPA # _____ ☐ Adjacent FPA # _____ Form completed by: _____



Forest Practices Application/Notification Western Washington

For DNR Region Office Use Only	
FPA/N No.:	2819391
Region:	NW
Date of Receipt:	5/16/2024

Project Name: Cavanaugh Road A Extension

PLEASE READ FPA/N INSTRUCTIONS PRIOR TO COMPLETING THIS APPLICATION.

1. Landowner, Timber Owner and Operator

Legal Name of Landowner Timberline Logging Inc.	Legal Name of Timber Owner ☒ Same as Landowner	Legal Name of Operator ☒ Same as Landowner
Mailing Address 900 Dupont Street	Mailing Address	Mailing Address
City, State, Zip Bellingham, WA 98225	City, State, Zip	City, State, Zip
Phone: 360-630-0725	Phone:	Phone:
Email: SamP@nielsenbrothers.net	Email:	Email:

Contact Person: Samuel Petska	Phone: 360-630-0725 Email: SamP@nielsenbrothers.net
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2. Are you converting any portion of the land to non-forestry use within three (3) years of harvest?

☒ No ☐ Yes If yes, include a SEPA checklist and SEPA determination (if applicable) and copies of county clearing and grading permits (if applicable).

3. If you are harvesting timber, enter the Forest Tax Number of the Timber Owner.

800033234

Contact the Department of Revenue at 360-534-1324 to obtain a forest tax number or further information.

4. Are you eligible for the Enhanced Aquatic Resources Requirements (EARR) Tax Credit? See FPA/N instructions for further information.

☐ No ☒ Yes

5. Are you a small forest landowner per RCW 76.09.450? See FPA/N instructions for details.

☐ No ☒ Yes **If yes, check all that apply.** If no, skip to Question 6.

- ☒ My entire proposed harvest area is on a single contiguous ownership consisting of one or more parcels.
- ☐ My proposed forest practices activities are within an area covered by an approved Forest Stewardship Plan or Forest Management Plan developed in cooperation with DNR.
- ☐ I received technical assistance from a DNR small forest landowner Stewardship and Technical Assistance Forester in preparing this FPA/N.

6. Are you substituting prescriptions from an approved state or federal conservation agreement or Watershed Analysis?

☒ No ☐ Yes Write "HCP" or "Using Prescriptions" in tables that apply. Attach or reference prescriptions and/or crosswalk(s) for approved state and federal conservation agreements or Watershed Analysis on file at the region office.

7. What is the legal description of your forest practices?

Section	Township	Range	E/W	Tax Parcel Number	County
27	33	06	E	P67021	Skagit

8. Have you reviewed this forest practices activity area to determine whether it may involve historic sites and/or Native American cultural resources? Please read FPA/N instructions prior to answering this question.

☒ No ☐ Yes If you made any contacts, please provide information in Question 28.

9. Do you have a DNR approved Road Maintenance and Abandonment Plan (RMAP)?

- a. ☒ No ☐ Yes If no, skip to c.,
If yes, enter your RMAP number and then continue to b.: _____
- b. ☐ No ☐ Yes Is this Forest Practices Application/Notification for work that is included in this approved RMAP?
Continue to Question 10.
- c. ☐ No ☒ Yes Is a Small Forest Landowner Checklist RMAP required? (see instructions)

10. Are there potential unstable slopes or landforms in or around the area of your forest practices activity?

☐ No ☒ Yes If yes, attach Appendix D. Slope Stability Informational Form and map of areas reviewed for and locations of unstable slopes and landforms found. If applicable, attach a geotechnical letter, memo, or report, Watershed Analysis prescriptions, and/or SEPA Environmental Checklist.

11. Is this Forest Practices Application/Notification (answer all of the following questions)

- a. ☒ No ☐ Yes A request for a multiyear permit? If yes, length requested: ☐ 4 years or ☐ 5 years.
See FPA/N instructions to verify you qualify for a multiyear permit.
- b. ☒ No ☐ Yes An Alternate Plan? If yes, include a template Alternate Plan Form or detailed plan. *See FPA/N instructions for details.*
- c. ☒ No ☐ Yes For a funded Forest Family Fish Passage Program (FFFPP) project?
- d. ☒ No ☐ Yes Within an urban growth area? If yes, review FPA/N instruction for additional required documents.
- e. ☒ No ☐ Yes Within a public park? If yes, include a SEPA Environmental Checklist or SEPA Determination, except for harvest/salvage of less than 5,000 board feet within a developed public park.
Park Name: _____
- f. ☒ No ☐ Yes Within 500 feet of a public park? Park Name: _____
- g. ☒ No ☐ Yes Part of an approved Conversion Option Harvest Plan (COHP) prepared by a local government entity? If yes, include a copy.
- h. ☒ No ☐ Yes Within 200 feet of the Ordinary High Water Mark (OHWM) or floodway of Type S Water? If yes, check with the county or city to determine whether a Substantial Development Permit is required under the local shoreline master plan.
- i. ☒ No ☐ Yes Within 50 miles of saltwater AND you own more than 500 acres of forestland in Washington state? If yes, include Appendix J. Marbled Murrelet Form or attach/reference applicable HCP prescriptions.
- j. ☒ No ☐ Yes In or directly adjacent to a potential Channel Migration Zone (CMZ)? If yes, include Appendix E. CMZ Assessment Form or attach/reference applicable HCP and/or Watershed Analysis prescriptions.

You are required to verify all waters within 200 feet of your proposed forest practices activities prior to submitting a Forest Practices Application/Notification. Use Appendix A. Water Type Classification Worksheet and/or a Water Type Modification form to explain how you verified water types. *See Water Typing Requirements in the FPA/N instructions for details.*

***** IF NOT WORKING IN OR OVER TYPED WATER, SKIP TO QUESTION 16 *****

Prior to answering Questions 12-15 in this section, please refer to the Forest Practices Application/Notification Instructions and Forest Practices Board Manual Section 5.

12. Are you proposing any of the following projects NOT permitted by current HPAs from WDFW?

- a. ☒ No ☐ Yes Installing, replacing, or repairing a culvert at or below the bankfull width of Type S or F water that exceeds a five percent gradient?
- b. ☒ No ☐ Yes Constructing, replacing, or repairing a bridge at or below the bankfull width of unconfined streams in Type S or F water?
- c. ☒ No ☐ Yes Placing fill material within the 100-year flood level of unconfined streams in Type S or F water?

13. Have you consulted with DNR and/or WDFW about the proposed hydraulic project(s) in or over Type S or F water?

☒ No ☐ Yes

- 14. If installing, replacing, removing, or maintaining structures in or over any typed water, complete the table below.** Provide crossing locations and identifiers on your Activity Map. Provide plan details in Question 28 or attach plan to the FPA/N. Type S, F and complex Type N waters require detailed plan information per WAC 222-24-042(2). See FPA/N instructions for detailed plan requirements.

Crossing Identifier (letter, number)	Water Type (S, F, Np, Ns)	Planned Activity (install, replace, remove, temporary, maintenance)	Structure (bridge, ford/equipment crossing*, puncheon/fill, arch, round culvert, other)	Proposed Size (width x length)	Culvert Design Method (F and S only) (no-slope, stream-sim, hydraulic, other)	Channel Bed Width (F and S only) (ft)	Stream Gradient (F and S only) (%)	Is this an RMAP Project
1	Np	install	ford	14' x 35'	N/A	N/A	N/A	N
2	Np	install	bridge	17' x 88'	N/A	N/A	N/A	N
3	Ns	install	ford	14' x 30'	N/A	N/A	N/A	N
4	Ns	install	culvert	36" x 30'	N/A	N/A	N/A	N
5	Ns	install	culvert	48" x 30'	N/A	N/A	N/A	N
6	Ns	install	culvert	36"x30'	N/A	N/A	N/A	N

*Fords and/or equipment crossings on Type S and F Waters may result in an unauthorized incidental take of certain threatened or endangered fish species. For more information, see 'Background for the State's Incidental Take Permits for certain threatened and endangered fish species' following Question 22 of the FPA/N Instructions.

- 15. If conducting any of the following activities in or over typed water, complete the table below.** Some activities will require identifiers on the Activity Map and/or more information in Question 28. See FPA/N instructions for details.

Activity	Type S Water	Type F Water	Type Np Water	Type Ns Water
Equipment Crossing*	PROVIDE DETAILS IN QUESTION 14		×	×
Suspending Cables				
Cable Yarding				
LWD Placement/Removal				
Beaver Dam Removal				
Felling and Bucking			×	×
Other (describe in Question 28)				

*Fords and/or equipment crossings on Type S and F Waters must be identified in Question 14.

- 16. If constructing or abandoning forest roads, complete the table below.** Show the road locations and identifiers on the Activity Map. Include abandonment plans for all temporary roads and abandonment projects. See FPA/N instructions for abandonment plan requirements.

Road Identifier (name, number)	Road Construction		Road Abandonment	
	Length (feet)	Steepest Side-slope (%)	Length (feet)	Abandonment Date (MM/YYYY)
Road A Extension	1325	50		
Road B			380	06/2025

17. If depositing spoils and/or expanding or developing a rock pit for forestry use, complete the table below.

Show locations and identifiers on the Activity Map.

Spoil Area Identifier (letter, number)	Amount of Spoils Deposited (cubic yards)	Rock Pit Identifier (name, number or letter)	Acres of New Rock Pit Developed	Acres of Existing Rock Pit Expanded

18. If operating within 200 feet of a wetland that is not associated with Type S or F Water, complete the table below. Wetlands associated with Type S or F Water should be listed in Question 25 or Question 23 if using 20-acre exempt rules. Show the boundaries of each wetland, along with its identifier, and Wetland Management Zone (WMZ) on the Activity Map. See FPA/N instructions for details.

Wetland Identifier (letter, number)	Wetland Type (A, B, Forested)	Planned Activities in Wetland	Planned Activities in Maximum Width WMZ	Total Wetland Acres	How many acres will be drained?	How many acres will be filled?

***** IF NOT HARVESTING OR SALVAGING TIMBER, SKIP TO QUESTION 27 *****

19. If harvesting or salvaging timber, complete the table below. Show all harvest areas and unit numbers on the Activity Map. For even-aged harvest units, show surrounding stand information on the Activity Map. See FPA/N instructions for details.

Unit Number	Harvest Method (Even-aged, Uneven-aged, Salvage, Right of Way)	Biomass Harvest (Y or N)	Logging System (rubber tired skidder, tracked skidder, dozer, shovel, full suspension cable, leading end suspension cable, helicopter, cable assist/tethered, animal, chipper, forwarder, slash bundler)	Acres to be Harvested	Volume to be Harvested (mbf)	Biomass Volume to be Harvested (tonnage)	Volume to be Harvested (%)	Steepest Slope in Harvest Unit (%)
1	Even-Aged	N	RTS, Dozer, Shovel	1.4	30	N/A	90	60

20. Reforestation. Check all that apply:

- ☒ Planting. Tree Species: Conifer
- ☐ Natural. Include a Natural Regeneration Plan
- ☐ Not required because of one of the following:
- ☐ I am converting some or all of this land to non-forestland in the next three (3) years or lands are exempted under WAC 222-34-050.
 - ☐ Individual dead, dying, down, or wind-thrown trees will be salvaged.
 - ☐ Trees are removed under a thinning program reasonably expected to maximize the long-term productivity of commercial timber.
 - ☐ I am leaving at least 100 vigorous, undamaged, and well distributed saplings or merchantable trees per acre.
 - ☐ An average of 190 tree seedlings per acre are established on the harvest area and my harvest will not damage them.
 - ☐ Road right-of-way or rock pit development harvest only.

**** IF YOU OWN MORE THAN 80 ACRES OF FORESTLAND IN WASHINGTON, SKIP TO QUESTION 25 ****

21. Are you using the exempt 20-acre parcel riparian management zone (RMZ) rule on Type S, F, or Np Waters?
See FPA/N instructions for details.

- ☐ No Skip to Question 25.
- ☐ Yes Continue to Question 22. *See FPA/N instructions for qualifications and information.*

22. Choose the answer below that best fits your situation. Show all RMZs on the Activity Map.

- ☐ a. **ALL of the following apply to me and my land: if no, answer b.**
- Between June 5, 2006 and today's date I have always owned less than 80 acres of forestland in Washington.
 - Between June 5, 2006 and today's date this parcel has always been 20 acres or less of contiguous ownership. *See RCW 76.09.020 for definition of "contiguous".*
 - Between June 5, 2006 and today's date this parcel has always been owned by me or someone else that has owned less than 80 acres of forestland in Washington.
- ☐ b. **ONE OR MORE of the following apply to me and/or my land (check all that apply):**
If any of the statements below apply AND you use the exempt 20-acre parcel RMZ rule, you are NOT authorized under the State's Incidental Take Permits. *See FPA/N instructions for details.*
- ☐ Between June 5, 2006 and today's date I have owned more than 80 acres of forestland in Washington.
 - ☐ Between June 5, 2006 and today's date this parcel has been a part of more than 20 acres of contiguous ownership. *See RCW 76.09.020 for definition of "contiguous".*
 - ☐ Between June 5, 2006 and today's date this parcel has been owned by someone that has owned more than 80 forested acres in Washington.

23. If harvesting on an exempt 20-acre parcel and are within 115 feet of a Type S or F Water or periodically inundated areas of their associated wetlands, complete the table below. If you are harvesting within 75 feet or within the maximum RMZ (whichever is less), stream shade must be assessed and met following harvest. In order to show that you have assessed shade and determined it to be met per the method described in Forest Practices Board Manual (FPBM) Section 1, fill out the minimum required shade cover percentage below or use 'Appendix F. Stream Shade Assessment Worksheet' if necessary. Show RMZs and stream segment identifiers on the Activity Map.

Stream Segment Identifier (letter)	Water Type (S, F,)	Segment Length (feet)	Bankfull Width (feet)	RMZ Maximum Width (feet)	Are you harvesting within the maximum RMZ? (Y or N)	Only complete if harvesting within 75 feet or within the maximum RMZ, whichever is less	
						Minimum Shade Required (%)	Shade met per FPBM – Section 1? (Y or N)

24. Are you harvesting within 29 feet of a Type Np Water on an exempt 20-acre parcel?

☐ No Skip to Question 27.

☐ Yes Describe leave tree strategy in Question 28 and Skip to Question 27. See FPA/N instructions for details.

25. If harvesting within 200 feet of any Type S or F Water or periodically inundated areas of their associated wetlands, complete the table below. Include Desired Future Condition (DFC) for all inner zone harvests unless you have an HCP prescription. If you are harvesting within 75 feet or within the maximum RMZ (whichever is less), stream shade must be assessed and met following harvest. In order to show that you have assessed shade and determined it to be met per the method described in Forest Practices Board Manual (FPBM) Section 1, fill out the minimum required shade cover percentage below or use 'Appendix F. Stream Shade Assessment Worksheet' if necessary. Show RMZs and stream segment identifiers on the Activity Map.

Stream Segment Identifier (letter)	Water Type (S, F,)	Site Class (I - V)	Stream Width (feet)	Is there a CMZ? (Y or N)	RMZ Harvest Code(s) (see instructions)	DFC Run Number	Total width of RMZ (feet)	Only complete if harvesting within 75 feet or within the maximum RMZ, whichever is less	
								Minimum Shade Required (%)	Shade met per FPBM – Section 1? (Y or N)

26. If harvesting within 50 feet of Type Np Water, complete the table below. Show RMZs and stream segment identifiers on the Activity Map.

Stream Segment Identifier (letter)	Total Stream Length in Harvest Unit (feet)	Length of No-harvest 50-foot Buffers in Harvest Unit (feet)
A	500	500
B	450	450

Stream Segment Identifier (letter)	Total Stream Length in Harvest Unit (feet)	Length of No-harvest 50-foot Buffers in Harvest Unit (feet)

27. How are the following currently marked on the ground? (Flagging color, paint color, road, fence, etc.)

Harvest/Salvage Boundaries: Pink Flagging

Clumped Wildlife Reserve Trees | Green Recruitment Trees: Orange LT paint on bole

Right-of-Way Limits | Road Centerlines: Orange flagging at CL

Stream Crossing Work: Blue and orange at CL

Riparian Management Zone Boundaries and Leave/Take Trees: Pink Flagging

Channel Migration Zone: N/A

Wetland Management Zone Boundaries and Leave/Take Trees: N/A

28. Additional information (attach additional pages if necessary):

- See FPA/N instructions for required plan information for hydraulic projects in or over Type S, F, or complex N Water.
- If applicable, include mitigation measures from a geotechnical memo, letter, or report.

[added Q 14 info
7 | NS | Install | Culvert | 36" x 30' | N/A | N/A | N/A | N]

29. We acknowledge the following:

- The information on this application/notification is true.
- We understand this proposed forest practice is subject to:
 - The Forest Practices Act and Rules, AND
 - All other federal, state or local regulations.
- Compliance with the Forest Practices Act and Rules does not ensure compliance with the Endangered Species Act or other federal, state or local laws.
- If we said that we would not convert the land to non-forestry use, the county or city may deny development permits on this parcel for the next six (6) years.
- The following may result in an unauthorized incidental take of certain endangered or threatened fish species:
 - Conversion of land to non-forestry use.
 - Harvesting within the maximum RMZ on a 20-acre exempt parcel that was acquired after June 5, 2006.
 - Equipment crossings or fords that are in or over Type S and F Waters.
- Inadvertent Discovery – Chapter 27.44, 27.53, 68.50 and 68.60 RCW
 - If you find or suspect you have found an archeological object or Native American cairn, grave, or glyptic record, immediately cease disturbance activity, protect the area and promptly contact the Department of Archaeology and Historic Preservation at 360-586-3077.
 - If you find or suspect you have found human skeletal remains, immediately cease disturbance activity, protect the area, and contact the County Coroner or Medical Examiner and local law enforcement as soon as possible. Failure to report human remains is a misdemeanor.

The landowner understands that by signing and submitting this FPA/N they are authorizing the Department of Natural Resources to enter the property in order to review the proposal, inspect harvest operations, and monitor compliance for up to three years after its expiration date. RCW 76.09.150

Signature of Legal Landowner <i>Samuel Petska For Timberline Analysis</i>	Signature of Legal of Timber Owner* (if different than landowner)	Signature of Legal Operator (if different than landowner)
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Print Name: <i>Samuel Petska</i>	Print Name:	Print Name:
Date: <i>5/15/24</i>	Date:	Date:

***NOTE:** if you are a "Perpetual Timber Rights Owner," and are submitting this without the landowner's signature, provide written evidence the landowner has been notified.

- Please make a copy of this FPA/N for your records.
- If this FPA/N contains a hydraulic project requiring WDFW concurrence review, it will not be available online for public review until after the WDFW concurrence review period.

The map shows a topographic view of the Lake Cavanaugh area. A yellow hatched area is labeled 'T33-0N R6-0E S28'. To its right is another area labeled 'T33-0N R6-0E S27'. A road project is indicated by a pink line labeled 'Unit 1' and a black line with numbered points 1 through 7. Other features include 'Road-B', 'South Shore Dr.', and various contour lines and water features. The map also shows a red line running vertically on the left side and a blue line running horizontally across the middle.

Appendix D. Slope Stability Informational Form

Complete and submit this form with your FPA/N if you indicated you are working in or around potentially unstable slopes or landforms.

- Instructions for Appendix D. Slope Stability Informational Form is located in the Forest Practices Application/Notification Instructions document.
- Refer to WAC 222-16-050(1)(d) and Forest Practices Board Manual Section 16 - *Guidelines for Evaluating Potentially Unstable Slopes* for definitions and descriptions of potentially unstable slopes or landforms.

1.a. What preliminary screening tools were used to identify unstable slopes or landform features in and/or around your proposal?

- ☒ Aerial Photo ☒ LiDAR ☒ Landslide Inventory ☒ GIS ☒ Field Review
☐ Forest Practices Application Mapping Tool (FPAMT) Resource Map ☐ Other. Describe:

b. Did any of the features identified during the preliminary screening not exist when you performed a field review?

- ☒ No. ☐ Yes. Describe:

2.a. Are you conducting forest practices activities in or over potentially unstable slopes or landforms?

- ☐ No. Skip to Question 3.a ☒ Inner Gorge ☒ Bedrock Hollow ☐ Convergent Headwall
☐ Groundwater recharge area of glacial deep-seated landslides ☐ Outer edges of meander bends
☐ Toe of deep-seated landslide with slopes $\geq 65\%$ ☐ Category E. Describe in "Other" below.
☐ Other. Describe:

b. What activities may occur in or over potentially unstable slopes or landforms? Check all that apply:

- ☐ Timber Harvest ☒ Road Construction ☐ Road Maintenance ☐ Suspending Cables
☐ Yarding ☐ Tailholds ☐ Other. Describe:

3.a. Are you conducting forest practices activities around potentially unstable slopes or landforms?

- ☐ No. Skip to Question 4.a ☒ Inner Gorge ☐ Bedrock Hollow ☐ Convergent Headwall
☐ Groundwater recharge area of glacial deep-seated landslides ☐ Outer edges of meander bends
☐ Toe of deep-seated landslide with slopes $\geq 65\%$ ☐ Category E. Describe in "Other" below.
☐ Other. Describe:

b. What activities may occur around potentially unstable slopes or landforms? Check all that apply:

- ☒ Timber Harvest ☒ Road Construction ☐ Road Maintenance ☐ Suspending Cables
☐ Yarding ☐ Tailholds ☐ Other. Describe:

4.a. Were any features identified in Question 3.a. excluded from your forest practices activity?

☐ No. Skip to Question 5 ☒ Yes. Continue to Question 4.b

b. Describe the field indicators you used to exclude potentially unstable slopes or landforms from your forest practices activity (*example*: flagging was placed a crown width away from the break in slope of the inner gorge):

Any inner gorge that is not already excluded from RMZ's was removed from the harvest area. The inner gorge features were marked at the break in slope, trees that were deemed to be "within" the feature or affecting the feature (roots) were left as non-harvest trees.

5. Are there areas of public use located in or around the area of your proposed forest practices activity?

☐ No. ☒ Yes. Check all that apply and show locations on map (Question 7).

☒ Public Road(s) ☐ Utilities ☐ Designated Recreation Area(s) ☒ Structure(s)
☐ Other. Describe:

6. Complete the table below with date(s) and person(s) that conducted field review(s):

Date	Name	Title/Position
9/18/23	Sam Petska	Forester
9/18/23	Shane Markus	Geologist

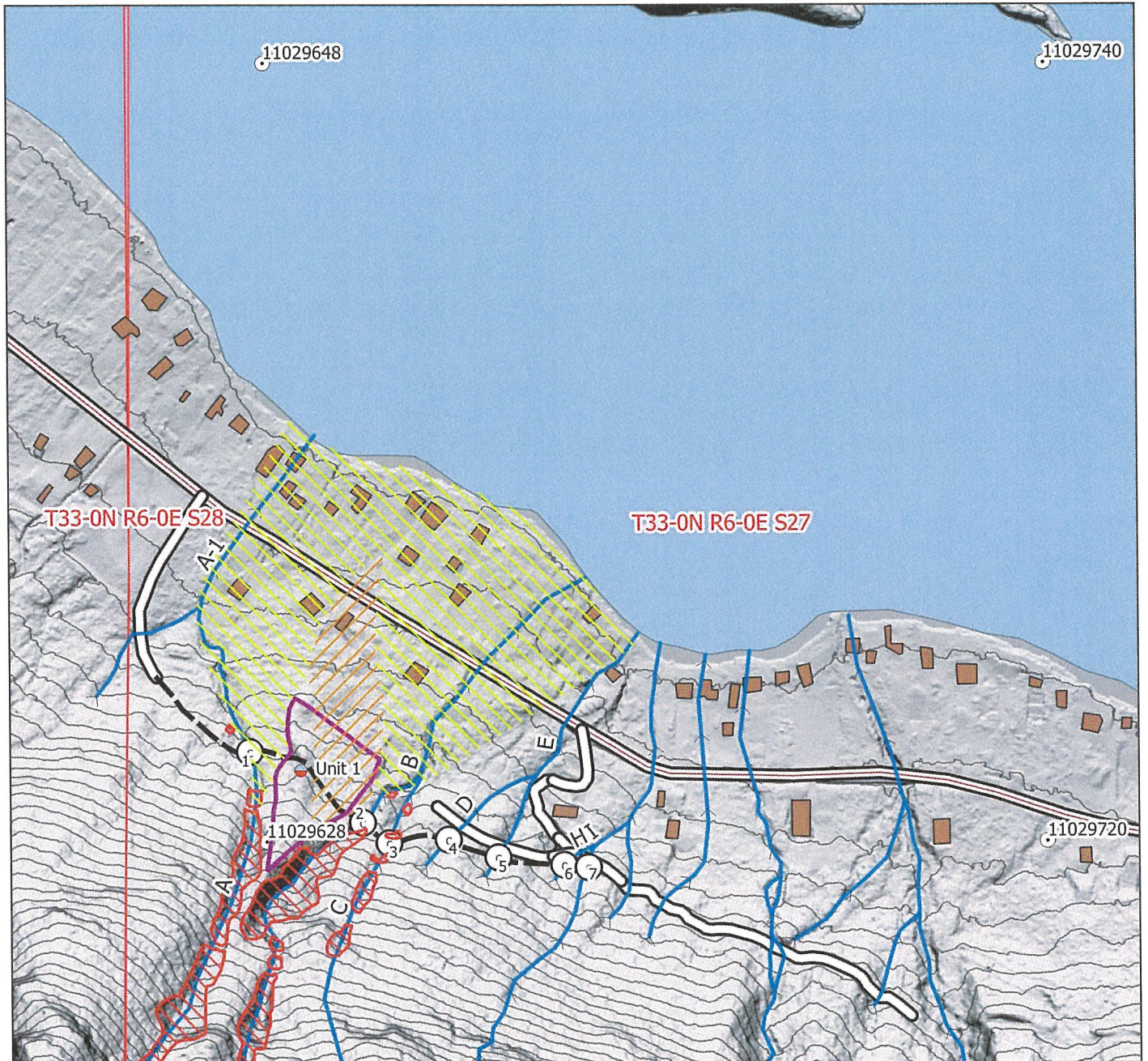
7. Attach a map showing the following:

- All areas reviewed.
- Locations of unstable slopes and landforms that were identified as described in Question 2.a. and 3.a.
- Locations where areas of public use exist as described in Question 5 above.

This map is intended to be developed by the field practitioner.

This can be a forest practices activity map, harvest map, or GIS map – See FPA/N instructions for example map.

WA DNR FPA Map - FPA #
 Township 33N Range 06E Section 27 - Parcel# P67021 Skagit County
 Timberline Logging LLC
 Elevation: 1200'
 Road Construction: ~1325' -- Unit 1 Harvest Area: 1.4 acres



- | | | |
|--------------------------------|---------------------------|------------|
| Cavanaugh Road A unit 1 | Final Relict Alluvial Fan | Structures |
| Cav Road A Extension Crossings | Final Alluvial Fan | FPA TICS |
| Cav Road A Extension | Existing Road | Section |
| Cavanaugh Road A Streams | 20ft Contours | Landing |
| Potential RILs | Lake Cavanaugh | |

N
 1:4800

5/14/24
 SP

Appendix E. CMZ Assessment Form

Stream Identifier: A-1

Complete and attach this informational form to your FPA/N if you answered 'Yes' to FPA Question 11j. Refer to [Forest Practices Board Manual Section 2—Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones](#) for guidance on evaluating Channel Migration Zones (forms within Forest Practices Board Manual 2 are optional).

Applicant Office Review:

1. Screening tools used:

☒ GIS ☒ LiDAR ☐ USGS Topographic Map ☒ Aerial Photo. Years: 1953, 1979

☐ Other. Describe: _____

2. Are you aware of channel movement or did you observe obvious channel movement between aerial photograph years?

☒ No. Continue to Question 3 ☐ Yes. Continue to Question 5

3. Evaluate valley confinement using USGS topographic map(s) or aerial photographs.

- ☒ Valley floor is significantly wider than the channel. Channel migration may be occurring.
☐ Valley floor is very narrow, obviously less than twice as wide as the channel. If you can clearly see this circumstance on the aerial photographs, it is unlikely that channel migration is occurring.

4. Did you observe any of the following on the aerial photographs?

- ☐ Side channels ☐ Large gravel bars ☐ Eroding banks ☐ High sinuosity or sharp channel bends
☐ Wood jams ☐ Multiple channels (braiding) ☐ New channels occurring between photo years (avulsions)

5. If CMZ is present, check the component(s) present in your delineation.

- ☒ Avulsion hazard area ☐ Erosion hazard area (attach erosion rate calculations)

6. What was the distance of channel walked? What was the length of CMZ boundary delineated?

450' of channel walked. --- CMZ delineated is 450'

7. Briefly describe how you determined a CMZ exists, how you delineated the outer edge of the CMZ, and how you marked the outer edge of the CMZ on the ground (flagging color, paint, etc.):

Stream A is a Np above stream A-1 which becomes a F bearing stream based on physical characteristics. Stream A has an associated alluvial fan which is shown in the slope stability map. By rule, the Np alluvial fan becomes a CMZ where the stream A turns into stream A-1, the F break based on physical characteristics. The edge of the CMZ then is related to the alluvial fan location as shown on the slope stability map and the geo report.

Field Review:

Date(s) of Field Review: 9/18/23

Person(s) that conducted field review: Samuel Petska

Name

Forester

Title/position

Shane Markus

Name

Geologist

Title/position

Appendix A. Water Type Classification Worksheet

Western Washington

Stream/Segment ID	Stream/Segment ID	Stream/Segment ID
A, B, C, W, N	D, E, H, I	
Date(s) Observed	Date(s) Observed	Date(s) Observed
9/18/23	9/18/23	
1. Did you determine fish use as described in the Forest Practices Board Manual Section 13? Or, does the stream have waiver characteristics? See WAC 222-16-031(3)(b)(ii).		
☒ No. Continue to 2. ☐ Yes. Meets waiver criteria. Skip to 6. ☐ Yes. Attach documentation or provide approved WTMF number: ☐ Fish found. Stop: Type F water. ☐ No fish. Skip to 6.	☒ No. Continue to 2. ☐ Yes. Meets waiver criteria. Skip to 6. ☐ Yes. Attach documentation or provide approved WTMF number: ☐ Fish found. Stop: Type F water. ☐ No fish. Skip to 6.	☐ No. Continue to 2. ☐ Yes. Meets waiver criteria. Skip to 6. ☐ Yes. Attach documentation or provide approved WTMF number: ☐ Fish found. Stop: Type F water. ☐ No fish. Skip to 6.
2. Were fish observed, or are fish known to use the stream any time of the year?		
☒ No. Continue to 3. ☐ Yes. Stop: Type F water.	☒ No. Continue to 3. ☐ Yes. Stop: Type F water.	☐ No. Continue to 3. ☐ Yes. Stop: Type F water.
3. Is there an impoundment (ponded water) upstream of the assessed segment that is greater than 0.5 acres?		
☒ No. Continue to 4. ☐ Yes. Stop: Type F water.	☒ No. Continue to 4. ☐ Yes. Stop: Type F water.	☐ No. Continue to 4. ☐ Yes. Stop: Type F water.
4. Are there segments within or upstream of the assessed portion of the stream where the average bankfull width is two feet or greater? AND, is the average stream gradient less than or equal to 16%?		
☒ No. Continue to 5. ☐ Yes. Stop: Type F water.	☒ No. Continue to 5. ☐ Yes. Stop: Type F water.	☐ No. Continue to 5. ☐ Yes. Stop: Type F water.
5. Are there segments within or upstream of the assessed portion of the stream where the average bankfull width is two feet or greater? AND, is the average stream gradient between 16 and 20%? AND, is the contributing basin to the stream greater than 50 acres?		
☒ No. Continue to 6. ☐ Yes. Stop: Type F water.	☒ No. Continue to 6. ☐ Yes. Stop: Type F water.	☐ No. Continue to 6. ☐ Yes. Stop: Type F water.
6. Does the stream segment contain water at all times during a normal rainfall year?		
☐ No. Continue to 7. ☒ Yes. Type Np water. Skip to 9	☒ No. Continue to 7. ☐ Yes. Type Np water. Skip to 9	☐ No. Continue to 7. ☐ Yes. Type Np water. Skip to 9
7. Is the stream segment downstream of a perennial source of water?		
☐ No. Continue to 8. ☐ Yes. Type Np water. Skip to 9	☒ No. Continue to 8. ☐ Yes. Type Np water. Skip to 9	☐ No. Continue to 8. ☐ Yes. Type Np water. Skip to 9
8. Is the stream physically connected by an above-ground channel to Type S, F or Np water?		
☐ No. Non-typed water. ☐ Yes. Type Ns water.	☐ No. Non-typed water. ☒ Yes. Type Ns water.	☐ No. Non-typed water. ☐ Yes. Type Ns water.
9. Describe how you determined the uppermost point of perennial flow. Include a description of its location and show the point on a map. Use a separate piece of paper if necessary.		
Entire stream is Np		

Small Forest Landowner Checklist Road Maintenance and Abandonment Plan

Use the following questions to determine if a SFL Checklist RMAP is required.

- A) Does your FPA/N include timber harvest or salvage?
☒ Yes. Continue to B. ☐ No. **Stop**, a checklist is not required.
- B) Are you hauling timber on existing forest roads on your property? *Not including: residential driveways; skid trails; haul roads on neighboring property;*
☒ Yes. Continue to C. ☐ No. **Stop**, a checklist is not required.
- C) Do you own more than 80 acres of forest land in Washington?
☐ Yes. A checklist is required. ☒ No. Continue to D.
- D) Is this FPA/N on a block of forest land that contains more than 20 contiguous acres?
☒ Yes. A checklist is required ☐ No. **Stop**, a checklist is not required.

1. This checklist applies to: Select one.

- ☒ The existing forest roads on my forestland that I will use for this FPA/N. *(minimum required)*
- ☐ I assessed all existing forest roads on my forestland. *Assessing all your forest roads is optional. If you choose this, you will not be required to submit additional checklists with future FPA/Ns.*
- If you check this box, include a Forest Practices Activity Map that shows all your forest roads.

2. What is the approximate total number of miles of existing forest road assessed: .1

3. Forest Road Assessment. Complete this question after you have assessed your existing forest roads.

Select all sediment and road issues that are known to be associated with your existing forest roads.

- ☐ I would like DNR to contact me for help with this section. *(If you check this box, you may leave the rest of the boxes in this question blank. DNR will contact you.)*
- ☐ Water from the road or ditch runs directly into typed water.
- ☐ Water flows under, over, or around the culvert.
- ☐ The culvert keeps filling with dirt.
- ☐ The road has large cracks or ruts.
- ☐ The road has sinkholes. *(not a pothole, but a hole that you can't drive over)*
- ☐ Dirt from the uphill side of the road keeps falling into the ditch-line before regularly scheduled maintenance.
- ☐ Dirt from the cut-slope keeps falling downhill into or near a stream, pond, or wetland.
- ☐ There are indications of past surface erosion.
- ☐ The road crosses typed water (a culvert, bridge, or ford exist)
- ☒ I have assessed my existing forest roads and they do not have any of the above issues.

4. Family Forest Fish Passage Program

The Family Forest Fish Passage Program (FFFPP) is a program to fix fish passage barriers, such as culverts. Not all culverts are fish passage barriers. For an evaluation of your potential fish passage barrier please contact DNR's Small Forest Landowners Office at 360-902-1404 or visit www.dnr.wa.gov/fffpp for more information.

Check the box that applies:

- ☒ Not applicable.
- ☐ I choose to enroll in the FFFPP and would like to have my potential barrier evaluated for eligibility. I understand by checking this box, I may be required to provide cost-share associated with the barrier removal or replacement.
- ☐ I choose not to enroll in the FFFPP and accept responsibility for removing or repairing any artificial fish barriers on my forest roads at my own expense.
- ☐ This barrier is already enrolled in the FFFPP.

5. Orphaned Roads

State law requires DNR to keep an inventory of orphaned roads that pose a risk to public safety or to the public resources. Your help with this inventory is requested.

Orphaned roads are roads on your forestland that have not been used for forest activities since 1974. Forest Practices activities include timber cutting, timber hauling, tree planting, brush control, pre-commercial thinning, timber salvage, etc.

Check the box that applies:

- ☒ I do not have orphaned roads that I think pose a risk to public resources or public safety; *e.g. houses, highways, county roads, streams, ponds, or wetlands.*
- ☐ I have orphaned roads that I think may pose a risk to public resources or public safety; *e.g. houses, highways, county roads, streams, ponds, or wetlands.* Please show locations of all orphaned roads on a separate Forest Practices Activity Map. (*This is not the same map that shows your harvest.*)
- ☐ I need help identifying orphaned roads.

6. Road Maintenance Obligations

All forest landowners have a legal obligation to maintain all their forest roads on their forestland to the extent necessary to prevent damage to public resources. This includes forest roads not shown on this assessment. See [WAC 222-24-052](http://www.wa.gov/wac/222-24-052). Best Management Practices (BMPs) for road maintenance are located in [Section 3](#) of the Forest Practices Board Manual. Both are available on the DNR website at: www.dnr.wa.gov.

Road maintenance includes:

- Inspecting forest roads and fixing damage before, during and after hauling timber and/or rock.
 - Keeping drainage structures (*relief culverts, ditches, water bars, dips, etc.*) and water crossings functional.
 - Making sure water from roads and ditches do not flow directly into streams, ponds, or wetlands.
- ☒ My existing roads are maintained to Forest Practices standards.



**Report of Geotechnical Services
Evaluation of Potentially Unstable Slopes and Landforms
and Alluvial Fans
Proposed Road A Extension and Harvest Unit
SW¼ Section 27, Township 33 North, Range 6 East
Lake Cavanaugh Area, Skagit County, Washington**

**November 1, 2023
ICE File No. 1319-005**

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**November 1, 2023
ICE File No. 1319-005**

**Prepared For:
Timberline Logging Inc.**

**Prepared By:
Icicle Creek Engineers, Inc.**



November 1, 2023

Sam Petska
Timberline Logging Inc.
900 Dupont Street
Bellingham, Washington 98225

Report
Geotechnical Services
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Proposed Road A Extension and Harvest Unit
SW¼ Section 27, Township 33 North, Range 6
East
Lake Cavanaugh Area, Skagit County,
Washington
ICE File No. 1319-005

1.0 INTRODUCTION

This report presents the results of Icicle Creek Engineers' (ICE's) geotechnical services regarding our evaluation of Potentially Unstable Slopes and Landforms and Alluvial Fans related to the proposed extension of Road A, and proposed timber harvest of an area adjacent to the road (collectively referred to as the Proposed Road A Extension and Harvest Unit), located in the southwest quarter of Section 27, Township 33 North, Range 6 East, Willamette Meridian, near Lake Cavanaugh in Skagit County, Washington. The location of the Proposed Road A Extension and Harvest Unit is shown relative to nearby physical features on the Vicinity Map, the Preliminary Activity Map, and the Field Review Route Map, Figures 1, 2 and 3, respectively.

Our services were provided in general accordance with our Budget Update #2 dated September 13, 2023 and were authorized in writing by Sam Petska with Timberline Logging Inc. (TLI) on September 13, 2023.

This report was prepared by Shane J. Markus, PE, LEG, and Brian R. Beaman, PE, LEG, LHG with ICE. Mr. Beaman and Mr. Markus are "Qualified Experts" (Washington State Department of Natural Resources - DNR Qualified Experts List, Engineering Geologist License Nos. 671 and 21013996, respectively). Mr. Beaman is licensed by the State of Washington as a Professional Engineer (PE), Engineering Geologist (LEG) and Hydrogeologist (LHG). Mr. Markus is licensed by the State of Washington as a PE and a LEG.

2.0 BACKGROUND INFORMATION

For the purpose of this evaluation, ICE reviewed the following information:

- DNR, August 21, 2023, *Chapter 222-16 Washington Administrative Code (WAC), Definitions.*
- DNR, August 21, 2023, *Chapter 222-10 WAC, State Environmental Policy Act Guidelines.*
- DNR, February 22, 2021, *Chapter 222-30 WAC, Timber Harvesting.*
- DNR, May 2016, *Forest Practices Board Manual, Section 16, Guidelines for Evaluating Potentially Unstable Slopes and Landforms*, 93 pages.

- DNR, October 8, 2013, *Chapter 222-14 WAC, Road Construction and Maintenance*.
- DNR, August 2013, *Forest Practices Board Manual, Section 3, Guidelines for Forest Roads*, 27 pages.
- DNR, February 2010, *Forest Practices Board Manual, Section 7, Guidelines for Riparian Management Zones*, 29 pages.
- DNR, June 2004, *Geologic Map of the Stimson Hill 7.5-Minute Quadrangle, Skagit and Snohomish Counties, Washington*, Open File Report 2004-9.
- DNR, Forest Practices Application Mapping Tool (FPAMT), <https://fpamt.dnr.wa.gov/>.
- DNR, Geologic Information Portal, regional geologic mapping and landslide compilations and inventory, <http://www.dnr.wa.gov/geologyportal>.
- DNR, GIS Data, Open Data, Climatology, Rain-on-Snow, <http://data-wadnr.opendata.arcgis.com/>.
- DNR, Geology GIS Data and Databases and Landslide Compilation/Inventory, <https://www.dnr.wa.gov/programs-and-services/geology/publications-and-data/gis-data-and-databases>.
- DNR, Washington LiDAR Portal, Light Detection and Ranging (LiDAR) Digital Terrain Model (DTM) raw data and hillshade image downloads, North Puget 2017 acquisition, <http://lidarportal.dnr.wa.gov/>.
- Environmental Systems Research Institute (Esri) ArcGIS version 10.6.0.8321, used to process the LiDAR raw DTM data for 5-foot topographic contour intervals and 70- and 100-percent slope inclination.
- Google Earth, aerial photographs dated July 19, 1990 and August 21, 2022.
- Skagit County, iMap property map, <https://skagitcounty.net/maps/imap/>.
- TLI, September 22, 2023, Plan Views and Road Profiles for Stream Crossings, four sheets.
- TLI, September 20, 2023, *Cavanaugh Road A Extension Draft*, scale 1:2,000.
- USGS EarthExplorer, aerial photographs dated August 13, 1953 and July 18, 1979, <http://earthexplorer.usgs.gov/>.

Based on our information review and discussions with Mr. Petska, we understand that TLI is proposing extending the existing Road A to the southeast by traversing the hillside about 1,100 feet, crossing three streams (the streams are referred to as Stream #1, Stream #2 and Stream #3 in this report, and the crossings are referred to as Stream Crossing #1, Stream Crossing #2 and Stream Crossing #3) and connecting to Road B. TLI is also planning to harvest about 1½ acres of timber in this area.

Based on our initial review, Stream Crossing #2 and Stream Crossing #3 occur within Potentially Unstable Slopes or Landforms (referred to as a “Rule-Identified Landforms” or “RILs” in this report). RILs are defined by WAC 222-16-050(1)(d)(i) A, B, C, D and E, and are further described in Section 16 of the DNR (May 2016) Forest Practices Board Manual (sections 4.1 through 4.5). We understand that TLI intends to submit the Proposed Road A Extension and Harvest Unit as a Class IV-Special Forest Practices Application (FPA). For this reason, TLI is required to provide the DNR with information that assists the agency in evaluating if the project could cause a “probable significant adverse impact”, including this report addressing WAC 222-10-030(1)(a,b,c).

Based on our initial review, some of the proposed forest practices may occur in the vicinity of Alluvial Fan landforms. Timber harvest is not permitted on Alluvial Fans associated with Type Np (no fish, perennial flow) streams, as described in WAC 222-30-021(2)(b)(vi).

The definition of an Alluvial Fan is presented in Section 2 and Section 7 of the DNR (2007; 2010) Forest Practices Board Manual, and WAC 222-16-010(“Sensitive Sites”)(5). The definition of an Alluvial Fan “...does not include features that were formed under climatic or geologic conditions which are not

currently present or that are no longer dynamic" (WAC 222-16-010 ("Sensitive Sites")(5)); for the purpose of this report, such features are referred to as "relict" Alluvial Fan landforms.

TLI requested that ICE evaluate RILs and Alluvial Fans, as they pertain to the road construction plans (including Stream Crossing #1, Stream Crossing #2, and Stream Crossing #3), and the proposed timber harvest.

3.0 PROPOSED FOREST PRACTICES DESCRIPTION

3.1 PROPOSED ROAD A EXTENSION

3.1.1 General

Based on discussions with and information provided by Mr. Petska, we understand that the Proposed Road A Extension includes construction of about 1,100 feet of new 14-foot-wide gravel-surfaced forest road, which extends off the end of the existing Road A to the southeast to connect to Road B. As previously described, the new road will cross three streams; the three stream crossings are described in detail below and are shown on Figures 2 and 3.

3.1.2 Stream Crossing #1 and Stream Crossing #3

Stream Crossing #1 and Stream Crossing #3 are planned as unvented fords, with the road surface dipping down to the stream bed elevation and matching the existing topography as closely as possible. We understand that the road will be constructed with a base layer of "1-man rock" (about 50 to 200 pounds, and 12 to 18 inches in diameter), and surfaced with 4- to 8-inch quarry spalls at the stream channel. We further understand that water bars are planned on each side of the ford at Stream Crossing #1, and on the west side of the ford at Stream Crossing #3.

3.1.3 Stream Crossing #2

Stream Crossing #2 is planned as an 88-foot-long prefabricated bridge. The left (west) abutment will be raised about 3 feet above the existing grade, and the right (east) abutment will be constructed at grade, resulting in about 15 feet of clearance between the bottom of the bridge structure and the 100-year high-water mark (as estimated by TLI).

3.2 PROPOSED HARVEST UNIT

TLI is proposing clearcut harvest of an approximately 1½-acre area vegetated with primarily mature conifer trees; we expect that ground-based equipment will be used to harvest this area. We expect that the existing Road A and the Proposed Road A Extension will be used to access the harvest area with heavy equipment and for log haul.

4.0 PUBLIC RESOURCES AND PUBLIC SAFETY

Based on our review of TLI's preliminary Activity Map (September 20, 2023; shown on Figure 2) and discussions with Mr. Petska, we understand that the three streams crossed by the Road A Extension alignment are likely to be Type Np (no fish, perennial flow) at the crossing locations, and Type F (fish use) downstream of the crossing locations. Lake Cavanaugh, an approximately 833-acre freshwater lake, is located about 750 to 1,250 feet downgradient of the Proposed Road A Extension and Harvest Unit area.

The Proposed Road A Extension and Harvest Unit are located upslope of South Shore Drive, a county-maintained rural two-lane road, and about 30 private residential lots (based on our review of Skagit County iMap). Based on our review of the 2022 aerial photograph, the approximate distribution of residential

structures on these lots is shown on Figure 3. As shown, several residential structures border each of the streams crossed by the Proposed Road A Extension. We expect that residential structures in this area are served by domestic water wells, lake water, or unauthorized water diversions from the hillside streams, all of which were taken into consideration as part of this evaluation.

5.0 SITE CONDITIONS

5.1 GENERAL

The surficial geologic conditions and geomorphic character of the Proposed Road A Extension and Harvest Unit and surrounding areas were evaluated based on regional geologic mapping and landslide inventories by the DNR (June 2004; Geologic Information Portal), review of historical aerial photographs dating back to 1953 (obtained from USGS EarthExplorer and Google Earth), review of LiDAR DTM-based bare-earth hillshade imagery (<http://lidarportal.dnr.wa.gov/>, North Puget 2017 acquisition), topographic contours and slope mapping (<http://lidarportal.dnr.wa.gov/>, North Puget 2017 acquisition; Esri ArcGIS 10.6), and field review of the area.

5.2 GEOGRAPHIC, TOPOGRAPHIC AND HYDROLOGIC SETTING

The Proposed Road A Extension and Harvest Unit are located on the north-facing hillside of Frailey Mountain overlooking the Lake Cavanaugh valley. The Proposed Road A Extension traverses the hillside, rising from about Elevation 1,120 feet where it extends off of Road A to about Elevation 1,170 feet near Stream Crossing #3, then descending to about Elevation 1,135 feet at the east end where it connects to Road B. The Proposed Harvest Unit varies from about Elevation 1,105 feet along the north end of the unit, to about Elevation 1,280 feet in the south end of the unit. Based on our review of climatology data available from the DNR (GIS Data, Open Data, Climatology), the Proposed Road A Extension and Harvest Unit are located within the Rain-on-Snow Precipitation Zone.

Stream #1, Stream #2 and Stream #3 drain topographic watersheds of about 13 acres, 22 acres and 2 acres, respectively, upstream of their respective proposed road crossings. Based on our review of climatology data available from the DNR (GIS Data, Open Data, Climatology), these watersheds are located within the Rain-on-Snow Precipitation Zone.

Based on the LiDAR DTM (<http://lidarportal.dnr.wa.gov/>, North Puget 2017 acquisitions), we mapped slopes that exceed 70- and 100-percent grade around the Proposed Road A Extension and Harvest Unit using Esri ArcGIS 10.6 as shown on the Slope Map, Figure 4. Slope inclinations were checked in the field at various locations for accuracy.

The LiDAR DTM-based bare-earth hillshade image (<http://lidarportal.dnr.wa.gov/>, North Puget 2017 acquisition) is shown on the LiDAR Image, Figure 5. The LiDAR image shows good quality (high resolution) data in the general area of the Proposed Road A Extension and Harvest Unit.

5.3 GEOLOGIC SETTING

The regional geologic mapping by the DNR (June 2004) is shown on the Geologic Map, Figure 6 (modified by ICE based on our review of improved topographic data, LiDAR and field review). Based on this mapping (DNR and ICE) and our field review, the following is a summary of the geologic units.

Alluvium and Mass Wasting Deposits (Qamw) – Deposits from hillside streams and mass wasting, typically consisting of silt, sand, gravel, cobbles and occasional boulders.

Glacial Till (Qgt_v) – Sediments deposited at the base of the Vashon-age continental ice sheet, typically consisting of an unsorted mixture of silty sand with gravel, cobbles and occasional boulders in a dense condition as a result of being overridden by glacial ice.

Advance Glaciolacustrine Deposits (Qgl_v) – Lakebed sediments deposited at the front of the advancing Vashon-age ice sheet, typically consisting of clay, silt, and silty clay with local dropstones, in a stiff condition as a result of being overridden by glacial ice.

Advance Outwash (Qga_v) – Stream and river sediments deposited at the front of the advancing Vashon-age ice sheet, typically consisting of stratified to massive sand with silt interbeds, in a dense/stiff condition as a result of being overridden by glacial ice.

Rocks of Bulson Creek (ΦEc_{bcg}) – Oligocene- to Eocene-age sedimentary bedrock, typically consisting of conglomerate with local interbeds and lenses of sandstone and siltstone.

Rocks of the Eastern Mélange Belt (JTmv_e) – Jurassic- to Triassic-age metamorphic bedrock, typically consisting of metamorphosed basalt, basaltic andesite and andesite, with local thick beds of metasandstone, and thin beds of breccia and tuff.

5.4 GEOMORPHIC SETTING

5.4.1 Regional Landslide Inventory and Geologic Map

The DNR regional landslide inventory (<http://www.dnr.wa.gov/geologyportal>) maps a landslide in the headwaters of Stream #2 (DNR Landslide ID No. 49519), presumably by aerial photograph review.

The DNR (June 2004) geologic map shows landslide deposits (Qls) and alluvial fan deposits (Qaf) in the vicinity of the Proposed Road A Extension and Harvest Unit, on the lower hillsides of Frailey Mountain. Based on our review of available information and field review, we have remapped these geologic units using improved topographic data and field review, as shown on Figure 6 as Alluvium and Mass Wasting Deposits (Qamw).

5.4.2 LiDAR Image Review

Based on our review of the LiDAR Image (Figure 5), the north-facing slopes upgradient of the Proposed Road A Extension and Harvest Unit are characterized by bands of oversteepened, rugged topography indicating near-surface bedrock. The Stream #1, Stream #2 and Stream #3 areas are characterized by moderately incised, deeply incised and lightly incised (respectively) channels, occasionally containing oversteepened reaches suggesting differential erosion and/or shallow landsliding.

The slopes in the vicinity of the Proposed Road A Extension and Harvest Unit are characterized by undulating topography consistent with a history of local erosion and sediment deposition. The shores of Lake Cavanaugh are characterized by generally smooth, rolling and gentle topography, consistent with low- to moderate-energy sediment deposition past the distal edge of Alluvial Fan landforms.

5.4.3 Aerial Photograph Review

ICE reviewed historical aerial photographs dated August 13, 1953 and July 18, 1979 (USGS EarthExplorer), and July 19, 1990 and August 21, 2022 (Google Earth), as shown on Figures 7 through 10. The following is

a summary of this review. No evidence of adverse erosion or slope instability was observed in the vicinity of or upgradient of the Proposed Road A Extension and Harvest Unit during our aerial photograph review.

1953 Aerial Photograph – The 1953 aerial photograph (Figure 7 – fair image quality) shows the Proposed Road A Extension and Harvest Unit area as undeveloped and forested. The trees appear smaller and denser than trees further up the hillside, suggesting that the forest in this area may be second-growth. South Shore Drive is visible downslope, and several private drives, perhaps servicing scattered residential structures, are subtly visible.

1979 Aerial Photograph – The 1979 aerial photograph (Figure 8 – poor image quality) shows the Proposed Road A Extension and Harvest Unit area as undeveloped and forested. South Shore Drive is visible downslope, and clearings on the shores of Lake Cavanaugh and docks on the lake suggest further scattered residential development downslope of the Proposed Road A Extension and Harvest Unit area.

1990 Aerial Photograph – The 1990 aerial photograph (Figure 9 – good image quality) shows the Proposed Road A Extension and Harvest Unit area as undeveloped and forested. South Shore Drive is visible downslope, and additional residential structures (as compared the 1979 photograph) are visible on the shores of Lake Cavanaugh.

2022 Aerial Photograph – The 2022 aerial photograph (Figure 10 – very good image quality) shows new forest roads (Road A and Road B) along with recent clearcuts west and east of the Proposed Road A Extension and Harvest Unit, though the immediate vicinity is still undeveloped and forested. South Shore Drive is visible downslope, and additional residential structures (as compared to the 1990 photograph) are visible on the shores of Lake Cavanaugh.

5.5 SITE OBSERVATIONS

5.5.1 General

Mr. Markus and Mr. Petska completed a field review of the Proposed Road A Extension and Harvest Unit and surrounding areas on September 18, 2023 to observe the character of the Proposed Road A Extension alignment (including the proposed stream crossings) and the Alluvial Fan landforms in the area. The weather during this site visit was mostly sunny, with temperatures in the 60s and 70s. Mr. Beaman and Mr. Petska previously completed field reviews in the area on April 11 and July 9, 2019. The routes of our field reviews (foot traverses) are shown on Figure 3. Our site observations are separated into the Proposed Road A Extension alignment (section 5.5.2 of this report), the Stream #1, Stream #2 and Stream #3 valleys (section 5.5.3 of this report), and the Alluvial Fan landforms (section 5.5.4 of this report). The descriptions of our site observations are provided below.

5.5.2 Proposed Road A Extension Alignment

Our site observations regarding the Proposed Road A Extension alignment are provided below, by approximate station interval. The Proposed Road A Extension alignment is approximately stationed from Station 0+00 (the current end of Road A) to Station 11+00 (the connection with Road B), as shown on Figure 2.

Stations 0+00 to 3+15 – The Proposed Road A Extension alignment completes a rising traverse from the end of Road A (approximately Station 0+00) to Stream Crossing #1 (approximately Station 3+15). This segment of the road alignment is characterized by undulating topography suggestive of normal hillside

erosional processes. This area is vegetated with mature conifer and occasional deciduous trees and medium dense brush, with occasional old-growth stumps. We did not observe surface water or seasonal groundwater seepage (such as dry channels) or evidence of recent slope instability or debris flow activity in this area.

Stations 3+15 to 6+85 – After Stream Crossing #1 (approximately Station 3+15), the alignment continues its rising traverse steeply (about 12-percent grade) southeast to Stream Crossing #2 (approximately Station 6+85). This segment of the road alignment is characterized by gently undulating topography, with a distinct ridgeline separating two Alluvial Fan landforms (see section 5.5.4 of this report). This area is vegetated with mature conifer trees and light brush. We did not observe surface water or seasonal groundwater seepage (such as dry channels) or evidence of recent slope instability or debris flow activity in this area.

Stations 6+85 to 7+80 – After Stream Crossing #2 (approximately Station 6+85), the alignment gradually descends and crosses a ridge before entering Stream Crossing #3 (approximately Station 7+80), where the road grade dips to the channel. This segment of the road alignment is characterized by broadly divergent, smooth topography, and is vegetated with mature conifer and occasional deciduous trees and medium dense brush. We did not observe surface water or seasonal groundwater seepage (such as dry channels) or evidence of recent instability or debris flow activity in this area.

Stations 7+80 to 11+00 – After Stream Crossing #3 (approximately Station 7+80), the alignment then descends the hillside to where it connects with Road B (approximately Station 11+00). This segment of the road alignment is characterized by rolling, irregular topography suggesting a history of local erosion. This segment traverses an area of recent clearcut, which is currently surfaced with young (less than 5 years old) conifer saplings and deciduous trees, and medium dense brush. We did not observe surface water or seasonal groundwater seepage (such as dry channels) or evidence of recent instability or debris flow activity in this area.

5.5.3 Stream #1, Stream #2 and Stream #3

As previously described, we observed landforms consistent with RILs in the vicinity of the proposed forest practices during our initial review. These landforms are shown on the Potentially Unstable Slopes and Landforms Map, Figure 11. The RILs are associated with Stream #1, Stream #2 and Stream #3; our site observations regarding these streams and related RILs are described below.

Stream #1 – Stream #1 at the proposed crossing location is contained within a broadly convergent swale with smooth, moderately-sloping (about 40- to 60-percent grade) side slopes. The swale is vegetated with mature conifer trees, occasional deciduous trees, dense to very dense brush, and old-growth stumps adjacent to the channel edge. The channel is about 2- to 4-feet wide in this area and is lined with cobbles and boulders up to about 18 inches in diameter. The stream was flowing at less than 1 gallon per minute (gpm) at the time of our September 18, 2023 site visit. We did not observe evidence of recent debris flow conveyance/accumulation, slope instability or adverse erosion in this area.

Upstream of the proposed crossing, Stream #1 is contained within a 15- to 30-foot-deep ravine with steep (70- to 100-plus-percent grade) side walls (Inner Gorge RIL). The ravine is vegetated with light to medium dense brush. Local bare soil on the ravine walls suggests adverse erosion; bedrock is also exposed in

places. The stream channel is scoured to bedrock. We expect debris flows may be occasionally sourced and conveyed through the Stream #1 ravine in this area.

Stream #2 – Stream #2 at the proposed crossing location is contained within an approximately 10- to 15-foot-deep distinct stream valley, with steep (about 70-percent grade) side walls (Inner Gorge RIL). The valley is vegetated with mature conifer trees and deciduous trees, and dense brush. The channel is about 4-feet wide in this area and is lined with cobbles and boulders up to about 18 inches in diameter. The stream was flowing slowly (less than 1 gpm) at the time of our September 18, 2023 site visit. We did not observe evidence of recent debris flow conveyance/accumulation, slope instability or adverse erosion in this area.

Upstream of the proposed crossing, Stream #2 is contained within an approximately 15- to 30-foot-deep ravine with steep (70- to 100-plus-percent grade) side walls (Inner Gorge RIL). The ravine is vegetated with light to medium dense brush. Local shallow landslide scarps are present on the ravine walls, and bedrock is exposed in places. The stream channel is scoured to bedrock. We expect debris flows may be occasionally sourced and conveyed through the Stream #2 ravine in this area.

Stream #3 – Stream #3 at the proposed crossing location is contained within a broadly convergent swale with smooth, moderately- to steeply-sloping (about 50- to 70-percent grade) side slopes (locally Inner Gorge RIL). The swale is vegetated with mature conifer and deciduous trees, and dense brush to the channel edge. The channel is about 2-feet wide in this area, and is lined with sand and gravel, and is scoured to bedrock in places. The stream channel was dry at the time of our September 18, 2023 site visit. We did not observe evidence of recent debris flow conveyance, slope instability or adverse erosion in this area.

Upstream of the proposed crossing, Stream #3 is contained within a convergent swale (locally sharply convergent) with 10- to 20-feet-high steeply-sloping (60- to 100-percent grade) side slopes (locally Inner Gorge RIL). The swale is vegetated with mature conifer and deciduous trees, and dense brush to the channel edge. Exposed bedrock is present in places. We observed Stream #3 to be flowing slowly (less than 1 gpm) during our July 9, 2019 field review. We did not observe evidence of recent debris flow conveyance, slope instability or adverse erosion in this area, and expect debris flows sourced and conveyed through the Stream #3 channel to be unlikely.

5.5.4 Alluvial Fan Landforms

As previously described, we observed features consistent with Alluvial Fan landforms in the vicinity of the proposed forest practices during our initial review. These landforms are shown on the Alluvial Fan Map, Figure 12, as AF-1 through AF-3. Our site observations regarding each landform are described below.

AF-1 – AF-1 is characterized by broadly divergent, smooth topography, with a stream bordering the west edge of the feature (Stream #1). Stream #1 is incised into AF-1 about 5 to 10 feet. AF-1 is vegetated with mature conifer trees, with light to medium dense brush. We did not observe recent evidence of channel avulsion, overtopping or accumulation on this surface, though we expect local areas within AF-1 may occasionally be affected by debris flows and high flow events sourced from the upper watershed of Stream #1.

AF-2 (Relict) – AF-2 is characterized by broadly divergent, smooth topography; the feature no longer contains a stream channel, though Stream #2 borders the upper (southeast) edge of AF-2 for about 100 feet before the stream diverts east. At the apex of AF-2, Stream #2 is incised into the adjacent topography about 10 to 15 feet and is lined with bedrock. AF-2 is vegetated with mature conifer trees and occasional deciduous trees, and light to medium dense brush.

We did not observe evidence of recent or historic channel avulsion, overtopping or accumulation on this surface. We did not observe evidence of streambank erosion or high water (such as scouring or sediment/woody debris deposition) at the apex, which could indicate a history of high flow events or debris flows with potential to inundate AF-3. In our opinion, AF-2 was formed when Stream #2 was at a higher base elevation, and therefore under geologic conditions which are not currently present and are no longer dynamic; based on our evaluation, AF-2 should be considered **Relict**, and is not considered an Alluvial Fan from a regulatory perspective (WAC 222-16-010("Sensitive Sites"))(5)).

AF-3 – AF-3 is characterized by broadly divergent, undulating topography dissected by Stream #2/#3 (downstream of their confluence). Stream #2/#3 is incised into AF-3 about 5 to 10 feet. AF-3 is vegetated with conifer trees, occasional deciduous trees, and medium dense to dense brush. We did not observe recent evidence of channel avulsion, overtopping or accumulation on this surface, though we expect local areas of AF-3 may be occasionally affected by debris flow and/or high flow events sourced from the upper watershed of Stream #3.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL

Based on our review of available information and our site observations, it is our opinion that the Forest Practices for the Proposed Road A Extension and Harvest Unit can be successfully/safely completed as planned, provided that the mitigations (including avoidance) presented in the following sections are implemented. Other buffers (riparian, wildlife and others) may be applicable. Standard Forest Practices should apply. The harvest area should be replanted as soon as practical.

6.2 POTENTIALLY UNSTABLE SLOPES AND LANDFORMS

6.2.1 General

Based on discussions with Mr. Petska, and review of TL's preliminary Activity Map (September 20, 2023 – shown on Figure 2), the Proposed Harvest Unit will exclude (avoid) RILs as part of the harvest plan. As shown on Figure 11, the Proposed Road A Extension will include crossing two RILs (Inner Gorge landforms at Stream Crossing #2 and Stream Crossing #3). As such, our responses to WAC 222-10-030 (1)(a, b, c) regarding Stream Crossing #2 and Stream Crossing #3 are given in sections **6.2.2**, **6.2.3** and **6.2.4** of this report.

6.2.2 WAC 222-10-030 (1)a – The likelihood that the proposed forest practices will cause movement on the potentially unstable slopes and landforms; or contribute to further movement of a potentially unstable slope or landform.

Stream Crossing #2 – Based on our field review and review of available information, the Inner Gorge RIL adjacent to Stream Crossing #2 has a **moderate** likelihood of failure; the Inner Gorge RIL upgradient of Stream Crossing #2 has a **high** likelihood of failure. We expect that Stream #2 will occasionally convey naturally-occurring debris flows sourced in its upper watershed. Because the bridge abutments are set

back at least 10 feet from the slope break (based on our review of the Plan Views and Road Profiles for Stream Crossings – TLI, September 22, 2023), we expect that installation of the pre-fabricated bridge should not affect stability of the Stream #2 valley walls. Additionally, because the bridge will have 15-feet of clearance between the bottom of the bridge and the 100-year high-water mark (notably, greater than the depth of the ravine), we expect direct impact by water, sediment or debris during a debris flow to be unlikely, and expect that the crossing site should allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.

If the mitigations presented in section 6.2.4 of this report are implemented, we do not expect that the proposed Forest Practices (installation of the pre-fabricated bridge) at Stream Crossing #2 will cause or contribute to further movement of the potentially unstable slope or landform.

Stream Crossing #3 – Based on our field review and review of available information, the Inner Gorge RIL adjacent to Stream Crossing #3 has a **low** likelihood of failure; the Inner Gorge RIL upgradient of Stream Crossing #3 has a **moderate** likelihood of failure. We expect that naturally-occurring debris flows within Stream #3 (sourced within the upper watershed) will be rare but possible. Based on our understanding of the unvented ford construction plans, and if the mitigations presented in section 6.2.4 of this report are implemented, we expect that the Stream Crossing #3 should allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.

If the mitigations presented in section 6.2.3 of this report are implemented, we do not expect that the proposed Forest Practices (limited tree cutting and vegetation clearing, minor grading (primarily cut), and installation of the unvented ford crossing) at Stream Crossing #3 will cause or contribute to further movement of the potentially unstable slope or landform.

6.2.3 WAC 222-10-030 (1)b – The likelihood of delivery of sediment or debris to any public resource, or in a manner that would affect public safety.

Stream Crossing #2 – We expect that Stream #2 occasionally conveys naturally-occurring debris flows sourced in the upper watershed. We expect that the naturally-occurring risk of delivery of sediment or debris to a public resource (Stream #2 within the Inner Gorge RIL) will be **moderate to high**. We expect that naturally-occurring debris flows conveyed by Stream #2 also have the potential to overtop the channel, avulse into a new channel, and possibly affect South Shore Drive and residential structures downstream of Stream Crossing #2, so we expect that the naturally-occurring risk to public safety will be **moderate to high**. If the mitigations presented in section 6.2.4 of this report are implemented, we expect that Stream Crossing #2 should allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.

If the mitigations presented in section 6.2.4 of this report are implemented, we do not expect that the proposed Forest Practices (installation of the pre-fabricated bridge) at Stream Crossing #2 will affect the likelihood of delivery of sediment to a public resource, or affect public safety.

Stream Crossing #3 – We expect Stream #3 to rarely convey naturally-occurring debris flows sourced in the upper watershed. We expect that the naturally-occurring risk of delivery of sediment or debris to a public resource (Stream #3 within the Inner Gorge RIL) will be **low to moderate**. We expect that naturally-occurring debris flows conveyed by Stream #3 have the potential to overtop the channel, avulse into a

new channel, and possibly affect South Shore Drive and residential structures downstream of Stream Crossing #3, so we expect that the naturally-occurring risk to public safety will be **low to moderate**. If the mitigations presented in section 6.2.4 of this report are implemented, we expect that Stream Crossing #3 should allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.

If the mitigations presented in section 6.2.4 of this report are implemented, we do not expect the proposed Forest Practices (limited tree cutting and vegetation clearing, minor grading (primarily cut), and installation of the unvented ford crossing) at Stream Crossing #3 will affect the likelihood of delivery of sediment to a public resource, or affect public safety.

6.2.4 WAC 222-10-030 (1)c – Any possible mitigation for the identified hazards and risks.

Stream Crossing #2 – Based on our evaluation, in our opinion, Stream Crossing #2 can be successfully/safely constructed using a pre-fabricated bridge as planned, implementing standard Forest Practices as described in WAC Chapter 222-24 (*Road Construction and Maintenance*) and the Forest Practices Board Manual (section 3 – *Guidelines for Forest Roads*), provided that the following specific mitigation recommendations are implemented.

- The bridge should be constructed as high above the channel as possible, to allow natural conveyance of water, sediment and debris under the bridge and to minimize the potential for direct impact of water, sediment or debris. We understand that the current plan results in about 15-feet of clearance between the bottom of the bridge and the 100-year-flow high-water mark; we expect impact by water, sediment or debris during a debris flow to be unlikely with 15-feet of clearance.
- The bridge abutments should be set at least 10 feet back from the slope break. We understand that the current plan results in abutments set back about 10 to 20 feet from the slope break.
- Tree cutting, brush clearing and grading should be limited within the Inner Gorge RIL to the minimum extent needed to install the bridge.
- Road drainage (ditches and culverts/water bars) should be installed along the road approach sections as needed to minimize runoff into the Inner Gorge RIL. If local stormwater is disposed within a RIL, the outlet should be armored or otherwise mitigated to reduce risk of erosion of natural RIL slopes.
- We understand that the footings will be supported on a bearing pad of compacted shot rock, surfaced with a leveling course pad of processed crushed rock. The bearing pad and leveling course pad should be placed and mechanically compacted to a firm and unyielding condition.
- ICE should be retained to observe the condition of the footing subgrade prior to placement of the bearing pad/leveling course pad, to evaluate whether the subgrade material is suitable for foundation support and to recommend subgrade improvements (as needed).

Stream Crossing #3 – Based on our evaluation, in our opinion, Stream Crossing #3 can be successfully/safely constructed using an unvented ford as planned, implementing standard Forest Practices as described in WAC Chapter 222-24 (*Road Construction and Maintenance*) and the Forest Practices Board Manual (section 3 – *Guidelines for Forest Roads*), provided that the following specific mitigation recommendations are implemented.

- The new road grade should be aligned with existing topography as closely as possible, to maintain natural flow paths and minimize the potential to impact natural streamflow and avulsion hazard.
- The crossing should be constructed as low as possible at the channel location to minimize the potential for “pirating” (capturing) the stream channel by the road grade.
- The road should be outsloped at the crossing location.

- Tree removal and brush clearing should be limited within the Inner Gorge RIL to the minimum extent needed to install the crossing.
- Road drainage (ditches and culverts/water bars) should be installed along the road approach sections as needed to minimize excess runoff to the Inner Gorge RIL. If local stormwater is disposed within a RIL, the outlet should be armored or otherwise mitigated to reduce risk of erosion of natural RIL slopes.
- We recommend against using sidecast fill to create road width in the proximity of Stream #3.
- Permanent cuts in glacial soils or weathered bedrock should be made at a maximum of 1H:1V (horizontal to vertical) in the Stream Crossing #3 area. Permanent cuts in intact bedrock can be made near vertical depending on the character of fractures in the bedrock.
- Stream Crossing #3 should be periodically monitored (visually) for erosion that may require maintenance.
- ICE should be retained to observe the condition of the unvented ford crossing after construction, to recommend erosion control and/or additional grading, as needed.

6.3 ALLUVIAL FAN LANDFORMS

6.3.1 General

As previously described, the Proposed Road A Extension includes crossing AF-1 and AF-2(Relict) with a new forest road, and construction of a stream crossing (Stream Crossing #1) within AF-1. The Proposed Harvest Unit includes clearcut harvesting timber within AF-2(Relict). Our discussions of each of the proposed forest practices in the context of Alluvial Fan landforms are given below.

Based on our evaluation, and our understanding of road construction and timber harvest plans, the proposed forest practices within the Alluvial Fan landforms can be completed successfully/safely as planned, provided the following mitigation recommendations are implemented.

6.3.2 Proposed Road A Extension

The Proposed Road A Extension completes a rising traverse across AF-1 and AF-2(Relict). Based on our evaluation, it is possible for the Stream A channel to avulse or overtop within the AF-1 area. In our opinion, construction of the Proposed Road A Extension will allow natural dynamic processes to continue in AF-1. As previously described, in our opinion, geologic processes that resulted in the forming of AF-2 are no longer dynamic. Based on our evaluation, the Proposed Road A Extension can be completed successfully/safely as planned, provided the following mitigation recommendations are implemented.

- New road construction and maintenance should be completed in accordance with Section 3 of the DNR Forest Practices Board Manual (August 2013).
- The proposed forest road should be outsloped within AF-1, and should approximately parallel topographic contours, to minimize potential to redirect stream flow and to allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.
- Cutting of trees and removal of vegetation within AF-1 should be limited to only those trees/vegetation necessary to construct the Proposed Road A Extension.
- The road should be constructed using full-bench methods (no sidecast fill) within AF-1.
- Waste material related to road construction (topsoil or road cut waste) should be end-hauled to an appropriate disposal location outside of AF-1.

6.3.3 Stream Crossing #1

The Proposed Road A Extension includes crossing Stream #1 within AF-1 using an unvented ford crossing. Based on our evaluation, during a naturally-occurring high flow and/or debris flow event, Stream #1 has

potential to overtop the channel, avulse into a new channel, and possibly affect South Shore Drive and residential structures downstream of Stream Crossing #1. If proper construction methods are implemented, in our opinion, Stream Crossing #1 (unvented ford) can be constructed without affecting the likelihood of avulsion or overtopping of the channel, and therefore should allow natural conveyance of water, sediment and debris during high flow and/or debris flow events. Based on our evaluation, Stream Crossing #1 (unvented ford) can be completed successfully/safely as planned, provided the following mitigation recommendations are implemented.

- The new road grade should be aligned with existing topography as closely as possible, to maintain natural flow paths and to minimize the potential to redirect stream flow and to allow natural conveyance of water, sediment and debris during high flow and/or debris flow events.
- The crossing should be constructed as low as possible at the channel location to minimize the potential for “pirating” (capturing) of the stream channel by the road grade.
- The road should be outsloped at the crossing location.
- Tree removal and brush clearing should be limited within the crossing area to the minimum extent needed to install the crossing.
- Road drainage (ditches and culverts/water bars) should be installed along the road approach sections as needed to minimize excess runoff into the crossing area.
- We recommend against using sidecast fill to create road width in the proximity of Stream #1.
- Stream Crossing #1 should be periodically monitored (visually) for erosion that may require maintenance.
- ICE should be retained to observe the condition of the unvented ford crossing after construction, to recommend erosion control and/or additional grading, as needed.

6.3.4 Proposed Harvest Unit

TLI is proposing clearcut harvest of timber within AF-2. As previously described, based on our evaluation, geologic processes related to the formation of AF-2 are no longer dynamic, as they occurred at a time when Stream #2 was at a higher base elevation; we expect that avulsion or overtopping of Stream #2 into the AF-2 area is highly unlikely. AF-2 is considered **Relict** and may be included in the harvest area (WAC 222-16-010(“Sensitive Sites”)(5)).

7.0 USE OF THIS REPORT

We have prepared this report for use by TLI to supplement the FPA permit process for the Proposed Road A Extension and Harvest Unit; this report is not applicable to other locations or for other purposes. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

There are always risks related to slope stability issues in mountainous areas. These areas are naturally active geologically with respect to mass wasting, erosional and sedimentation processes exacerbated by other factors such as earthquakes, extreme precipitation events and climate change. This risk related to slope stability issues can be reduced by using currently accepted prescribed methods, but the risk cannot be eliminated. Proper logging methods, including road construction/decommissioning, drainage, and erosion control, before and after logging, are key to reducing risks of slope instability.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty, express or implied, should be understood.

We trust this report meets your present needs. Please contact us if you have any questions or need additional information.



Yours very truly,
Icicle Creek Engineers, Inc.

Shane J. Markus, PE, LEG
Senior Project Engineer/Geologist



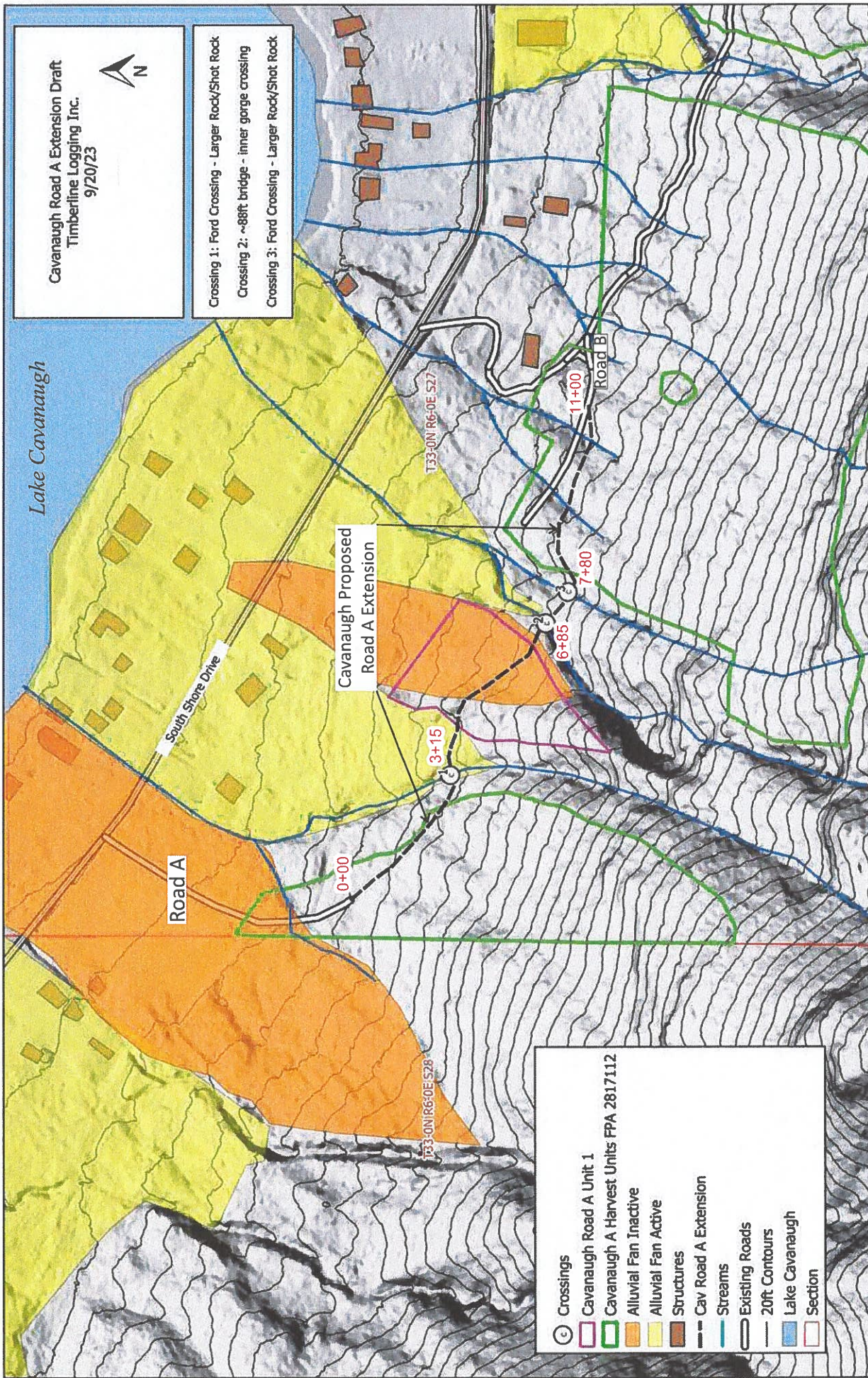
Brian R. Beaman, PE, LEG, LHG
Principal Engineer/Geologist/Hydrogeologist

Document ID: 1319005.Report

Attachments: Vicinity Map – Figure 1
Preliminary Activity Map – Figure 2
Field Review Route Map – Figure 3
Slope Map – Figure 4
LiDAR Image – Figure 5
Geologic Map – Figure 6
1953 Aerial Photograph – Figure 7
1979 Aerial Photograph – Figure 8
1990 Aerial Photograph – Figure 9
2022 Aerial Photograph – Figure 10
Potentially Unstable Slopes and Landforms Map – Figure 11
Alluvial Fan Map – Figure 12

Submitted via email

FIGURES



Preliminary Activity Map dated September 20, 2023 provided by Timberline Logging Inc.

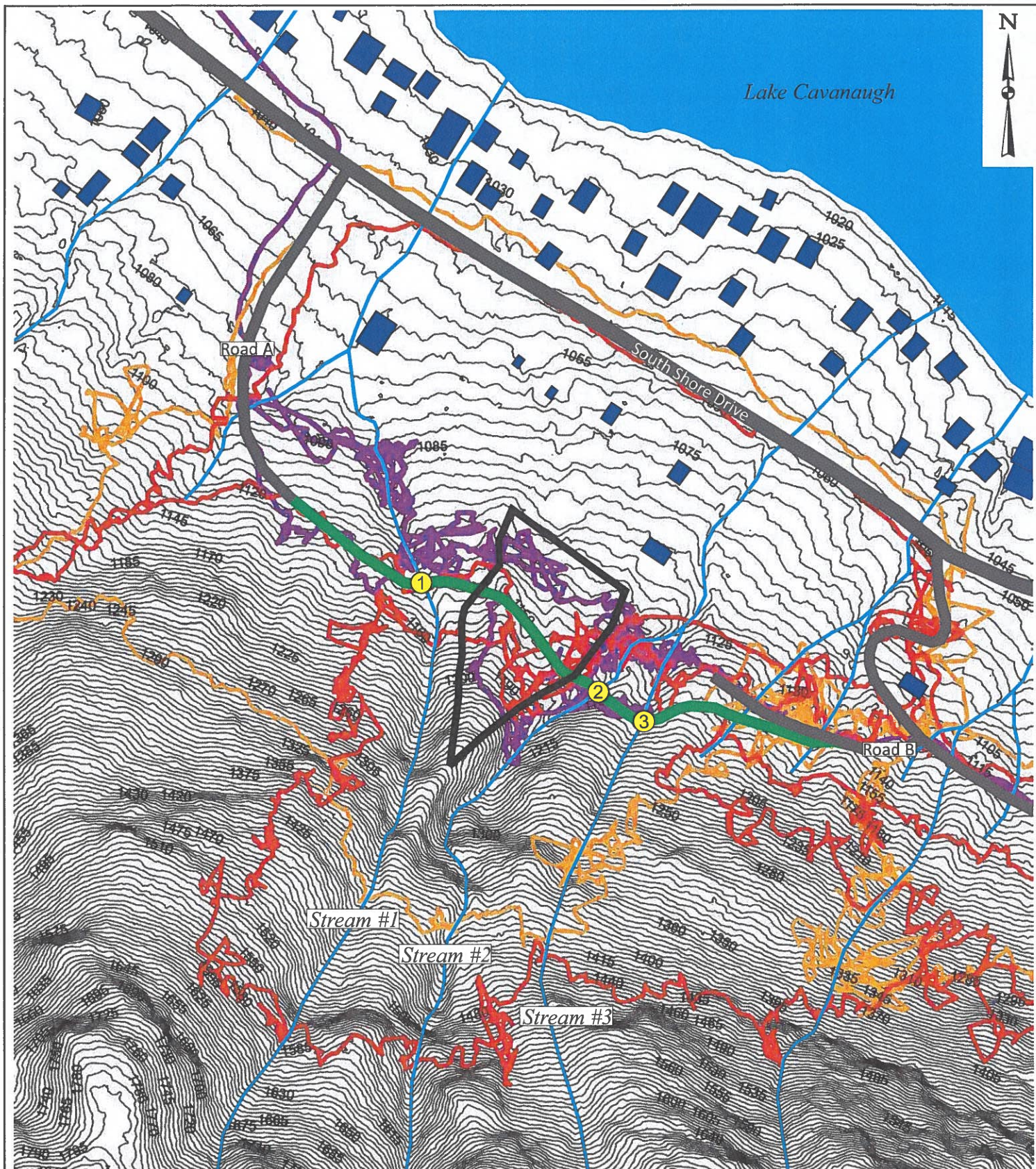


PRELIMINARY ACTIVITY MAP

PROPOSED ROAD A EXTENSION AND HARVEST UNIT

ICICLECREEK ENGINEERS
 29335 NE 20th Street
 Carnation, Washington 98014
 (425) 333-0093

SCALE: As Shown	ICE FILE NO.
DESIGNED: ---	1319-005
DRAWN: SIM	Figure
CHECKED: BMM/SK	2
DATE: 11/01/23	



Digital Terrain Model (DTM) data (North Puget 2017 acquisition) obtained from the Washington State Department of Natural Resources Washington LiDAR Portal (<http://lidarportal.dnr.wa.gov/>); processed by ICE for 5-foot topographic contour intervals using Environmental Systems Research Institute (Esri) ArcGIS 10.6.

0 200 400
Approximate Scale in Feet

EXPLANATION

- ICE Field Review Routes (Red = April 11, 2019; Orange = July 9, 2019; Purple = September 18, 2023)
- Existing Structures (approximate; from 2022 aerial photograph)
- Proposed Road A Extension
- ① Proposed Stream Crossing
- Proposed Harvest Unit

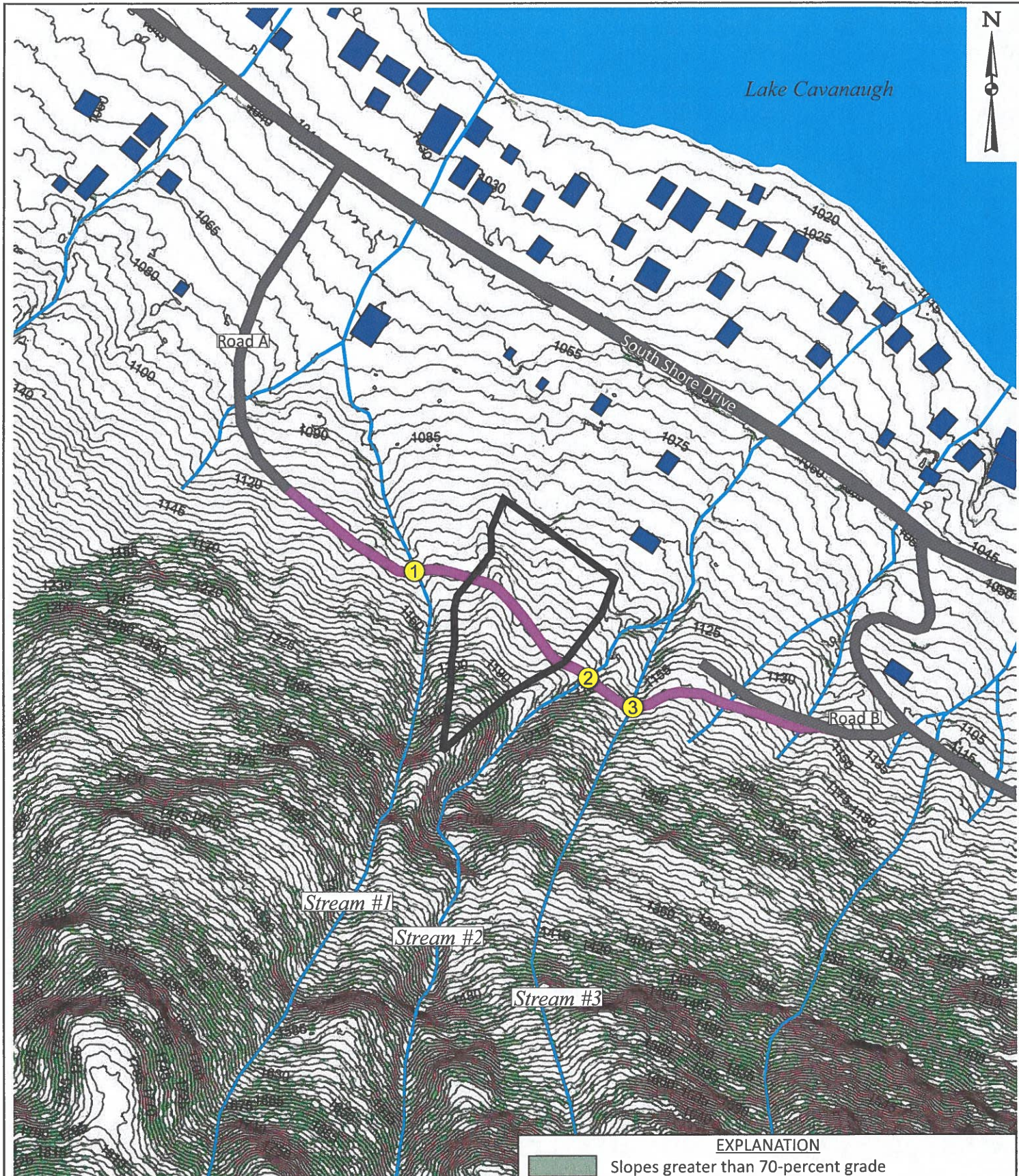
FIELD REVIEW ROUTE MAP

PROPOSED ROAD A EXTENSION AND HARVEST UNIT

ICICLECREEK ENGINEERS
29335 NE 20th Street
Carnation, Washington 98014
(425) 333-0093

SCALE: As Shown
DESIGNED: ---
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CHECKED: BRB/KSK
DATE: 11/01/23

ICE FILE NO.
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Digital Terrain Model (DTM) data (North Puget 2017 acquisition) obtained from the Washington State Department of Natural Resources Washington LiDAR Portal (<http://lidarportal.dnr.wa.gov>); processed by ICE for 5-foot topographic contour intervals and 70- and 100-percent slopes using Environmental Systems Research Institute (Esri) ArcGIS 10.6.

0 200 400
Approximate Scale in Feet

EXPLANATION	
	Slopes greater than 70-percent grade
	Slopes greater than 100-percent grade
	Existing Structures (approximate; from 2022 aerial photograph)
	Proposed Road A Extension
	Proposed Stream Crossing
	Proposed Harvest Unit

SLOPE MAP

PROPOSED ROAD A EXTENSION AND HARVEST UNIT

**ICICLECREEK
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29335 NE 20th Street
Carnation, Washington 98014
(425) 333-0093

SCALE: As Shown
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DATE: 11/01/23

ICE FILE NO.
1319-005
Figure
4



Digital Terrain Model (DTM) bare-earth hillshade image (North Puget 2017 acquisition) obtained from the Washington State Department of Natural Resources Washington LIDAR Portal (<http://lidarportal.dnr.wa.gov>).

0 200 400
Approximate Scale in Feet

EXPLANATION

- Existing Structures (approximate; from 2022 aerial photograph)
- Proposed Road A Extension
- 1 Proposed Stream Crossing
- Proposed Harvest Unit

LIDAR IMAGE

PROPOSED ROAD A EXTENSION AND HARVEST UNIT

**ICICLECREEK
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29335 NE 20th Street
Carnation, Washington 98014
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SCALE: As Shown
DESIGNED: —
DRAWN: SIM
CHECKED: BRB/KSK
DATE: 11/01/23

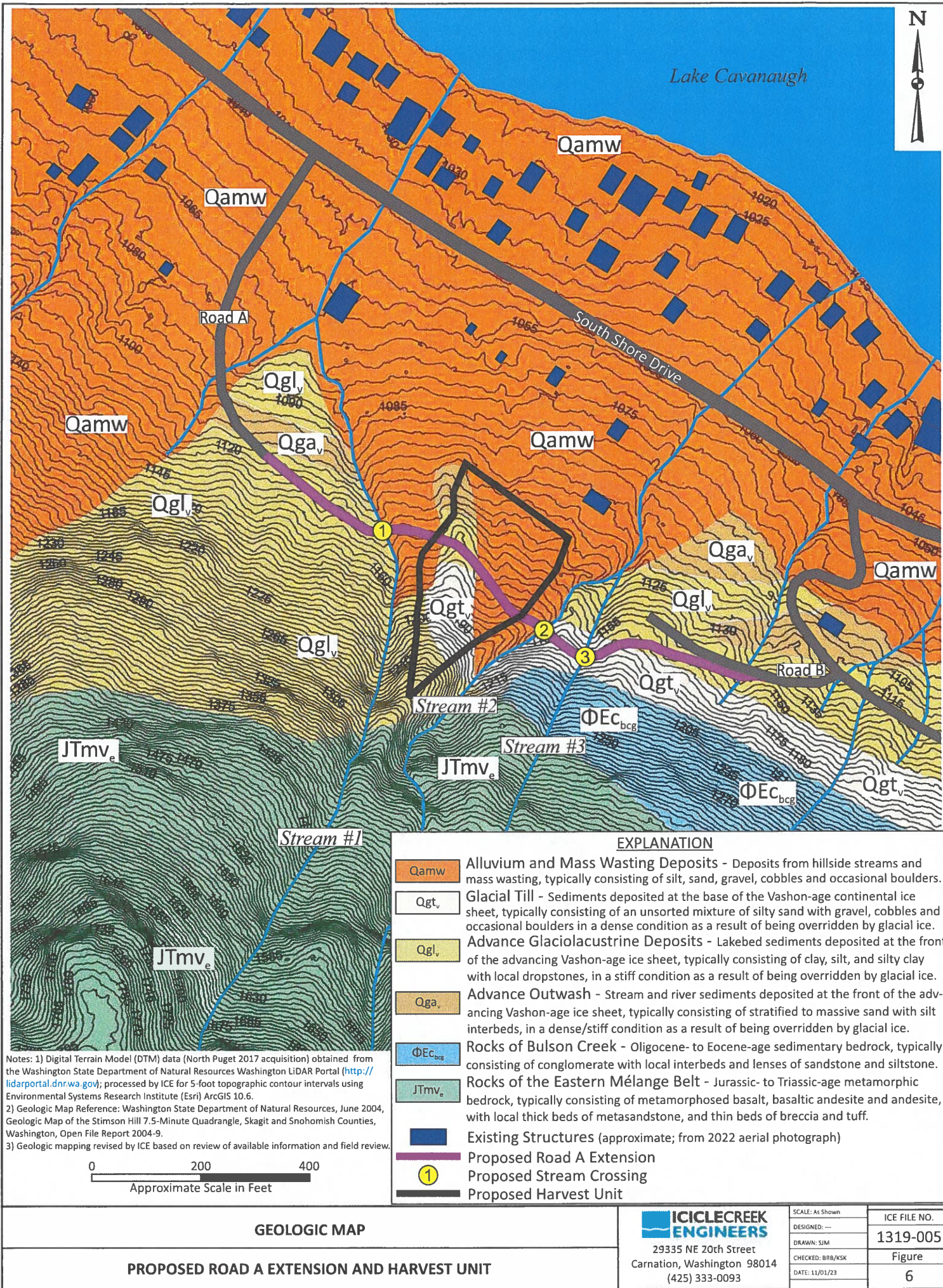
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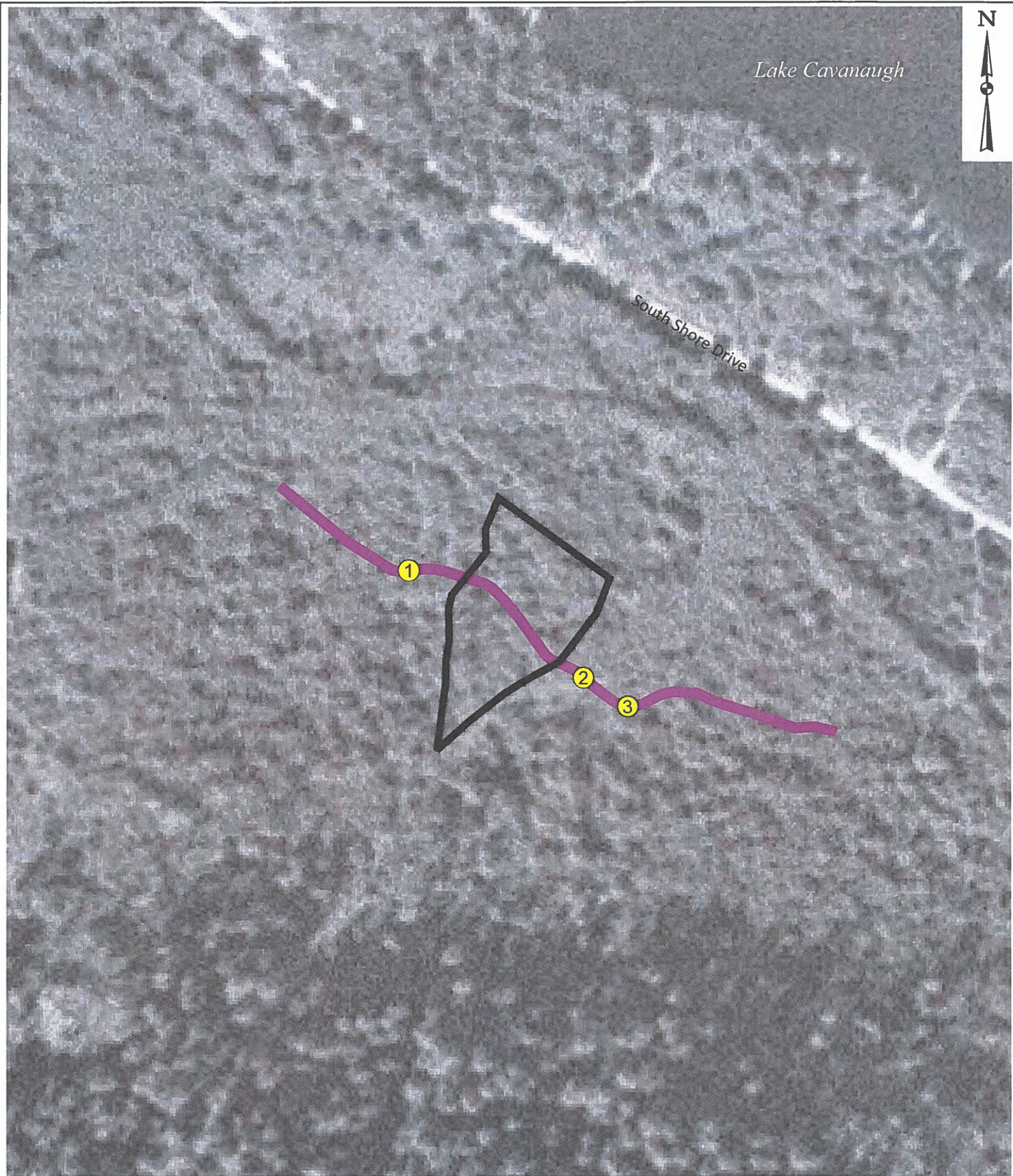
1319-005

Figure

5

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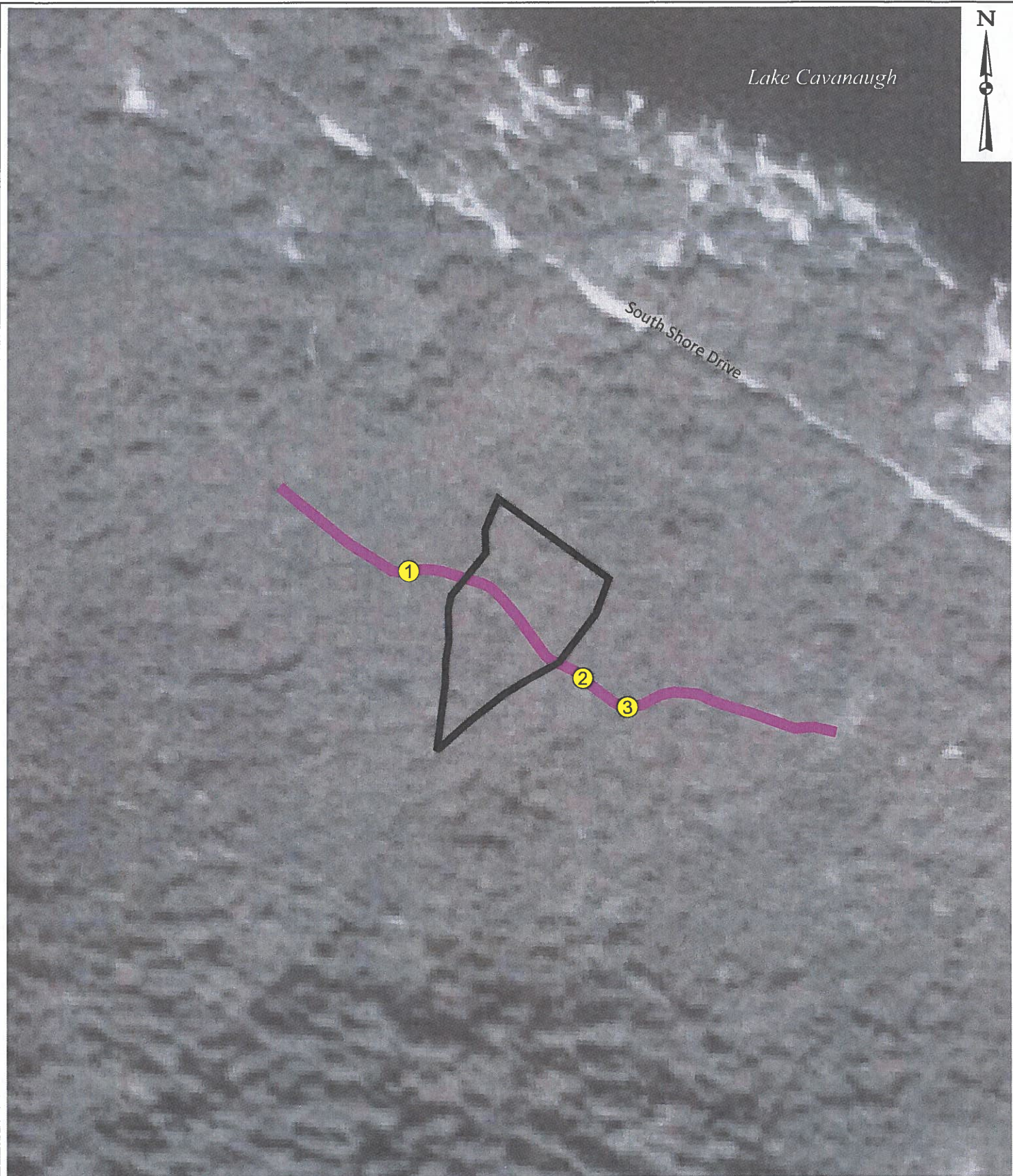


Aerial photograph dated August 13, 1953 obtained from USGS EarthExplorer (<https://earthexplorer.usgs.gov/>).

0 200 400
Approximate Scale in Feet

EXPLANATION	
	Proposed Road A Extension
	Proposed Stream Crossing
	Proposed Harvest Unit

1953 AERIAL PHOTOGRAPH	 29335 NE 20th Street Carnation, Washington 98014 (425) 333-0093	SCALE: As Shown	ICE FILE NO.
		DESIGNED: ---	1319-005
PROPOSED ROAD A EXTENSION AND HARVEST UNIT		DRAWN: SJM	Figure
		CHECKED: BRB/KSK	7
		DATE: 11/01/23	

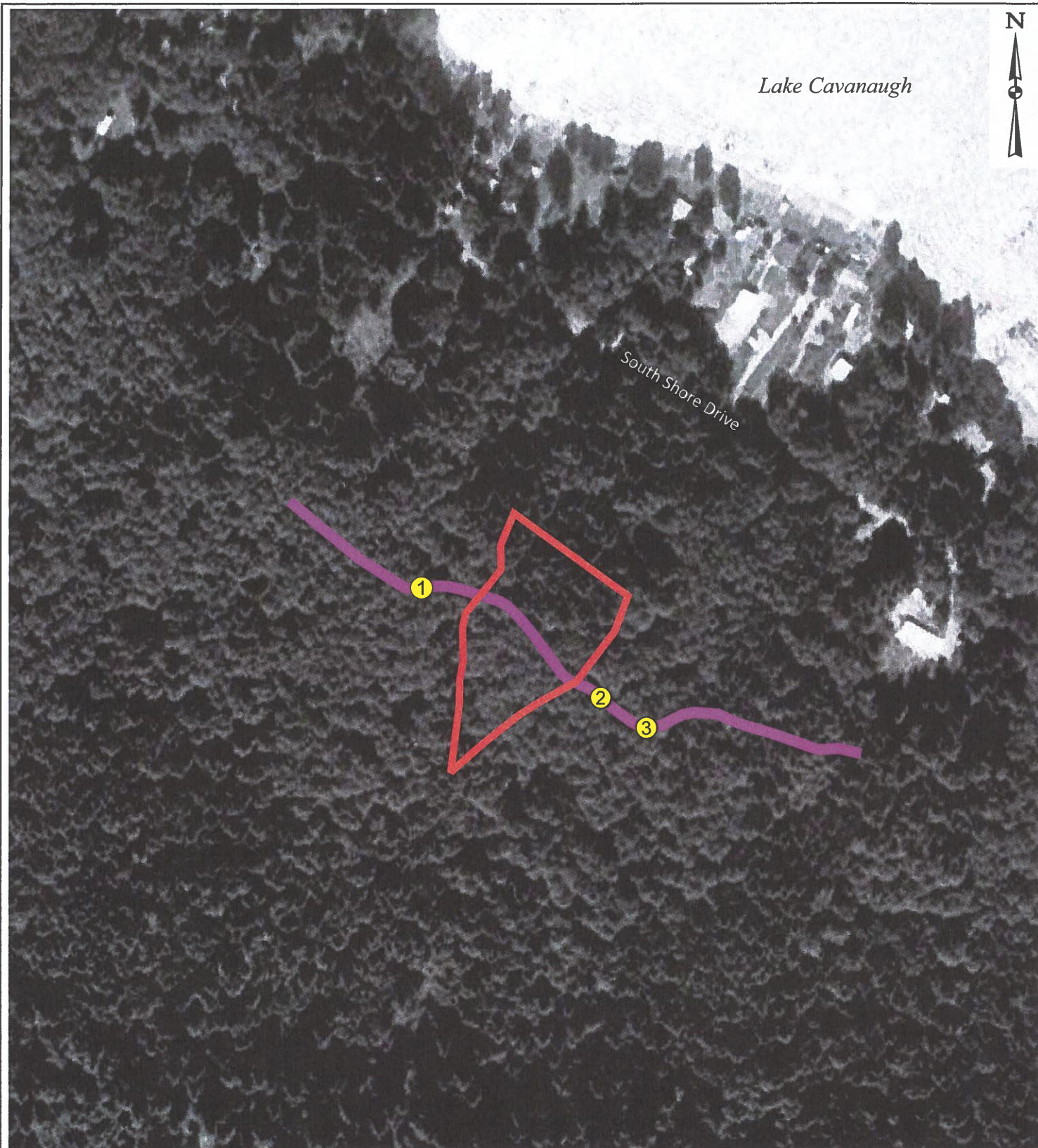


Aerial photograph dated July 18, 1979 obtained from USGS EarthExplorer (<https://earthexplorer.usgs.gov/>).



EXPLANATION	
	Proposed Road A Extension
	Proposed Stream Crossing
	Proposed Harvest Unit

1979 AERIAL PHOTOGRAPH	 29335 NE 20th Street Carnation, Washington 98014 (425) 333-0093	SCALE: As Shown	ICE FILE NO.	
		DESIGNED: ---	1319-005	
		DRAWN: SJM		
		PROPOSED ROAD A EXTENSION AND HARVEST UNIT	CHECKED: BRB/KSK	Figure
			DATE: 11/01/23	8



Aerial photograph dated July 19, 1990 obtained from Google Earth.



EXPLANATION

- Proposed Road A Extension
- 1 Proposed Stream Crossing
- Proposed Harvest Unit

1990 AERIAL PHOTOGRAPH

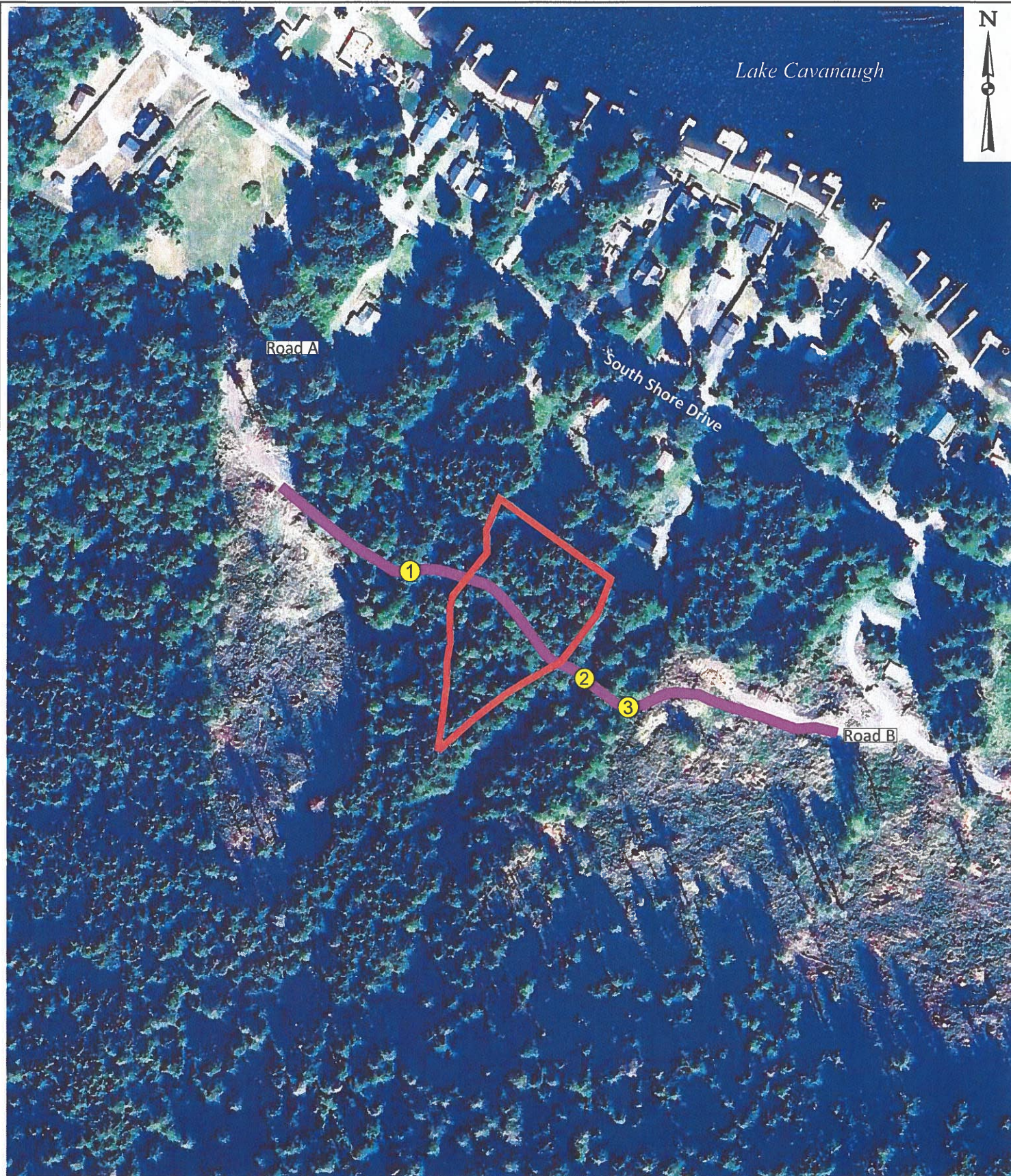
PROPOSED ROAD A EXTENSION AND HARVEST UNIT

**ICICLECREEK
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SCALE: As Shown
DESIGNED: ---
DRAWN: SJM
CHECKED: BJB/KSK
DATE: 11/01/23

ICE FILE NO.
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Aerial photograph dated August 21, 2022 obtained from Google Earth.



EXPLANATION

- Proposed Road A Extension
- Proposed Stream Crossing
- Proposed Harvest Unit

2022 AERIAL PHOTOGRAPH

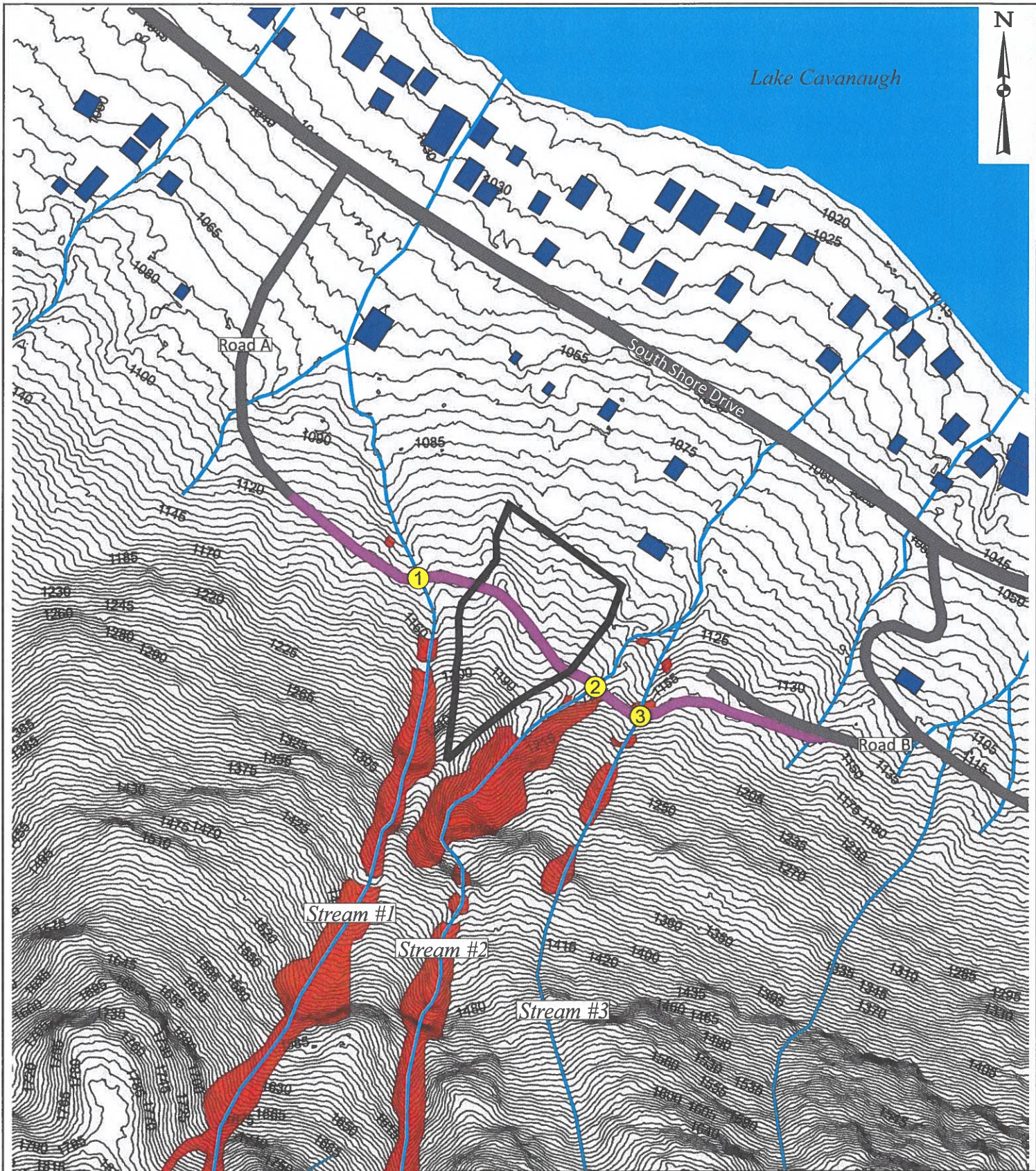
PROPOSED ROAD A EXTENSION AND HARVEST UNIT

**ICICLE CREEK
ENGINEERS**
29335 NE 20th Street
Carnation, Washington 98014
(425) 333-0093

SCALE: As Shown
DESIGNED: ---
DRAWN: SJM
CHECKED: BRB/KSK
DATE: 11/01/23

ICE FILE NO.
1319-005
Figure
10

2819391



Notes: 1) Digital Terrain Model (DTM) data (North Puget 2017 acquisition) obtained from the Washington State Department of Natural Resources Washington LIDAR Portal (<http://lidarportal.dnr.wa.gov>); processed by ICE for 5-foot topographic contour intervals using Environmental Systems Research Institute (Esri) ArcGIS 10.6.
 2) Rule-Identified Landforms (RILs) only mapped upslope of the Proposed Road A Extension.
 3) See report text for additional details.



EXPLANATION	
	Rule-Identified Landforms (RILs) - Inner Gorge and Bedrock Hollow landforms with potential to deliver sediment to a public resource or to affect public safety.
	Existing Structures (approximate; from 2022 aerial photograph)
	Proposed Road A Extension
1	Proposed Stream Crossing
	Proposed Harvest Unit

POTENTIALLY UNSTABLE SLOPES AND LANDFORMS MAP		 29335 NE 20th Street Carnation, Washington 98014 (425) 333-0093	SCALE: As Shown	ICE FILE NO.
PROPOSED ROAD A EXTENSION AND HARVEST UNIT			DESIGNED: ---	1319-005
			DRAWN: SIM	Figure
			CHECKED: BRB/KSK	11
			DATE: 11/01/23	

